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Implications of Higher Global Food Prices for Poverty in Low-Income Countries

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Abstract

In many poor countries, the recent increases in prices of staple foods raise the real incomes of those selling food, many of whom are relatively poor, while hurting net food consumers, many of whom are also relatively poor. The impacts on poverty will certainly be very diverse, but the average impact on poverty depends upon the balance between these two effects, and can only be determined by looking at real-world data. Results using household data for ten observations on nine low-income countries show that the short-run impacts of higher staple food prices on poverty differ considerably by commodity and by country, but, that poverty increases are much more frequent, and larger, than poverty reductions. The recent large increases in food prices appear likely to raise overall poverty in low income countries substantially.

This paper—a product of the Trade Team, Development Research Group—is part of a larger effort in the department to understand the implications of trade policies and world price developments for poverty. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at wmartin1@worldbank.org.

Implications of Higher Global Food Prices for Poverty in Low-Income Countries

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[*] The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not represent the views of the World Bank or any other individual or organization.

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1 Introduction

Since 2005, the world has experienced a dramatic surge in the price of many staple food commodities. The price of maize increased by 80 percent between 2005 and 2007, and has since risen further. Many other commodity prices also rose sharply over this period: milk powder by 90 percent, wheat by 70 percent and rice by about 25 percent. Annual average prices of key staple foods are shown in Figure 1. Clearly, such large increases in prices may have tremendous impacts on the real incomes of poor households in developing countries.

Despite widespread concern about the impacts of high food prices on poor people and on social stability (eg FAO 2007; World Bank 2008a), little hard information appears to be available on actual impacts on poor people. The overall impact on poverty rates in poor countries depends on whether the gains to poor net producers outweigh the adverse impacts on poor consumers. Whether higher food prices improve or worsen the situation of particular households depends importantly on the products involved; the patterns of household incomes and expenditures; and the policy responses of governments (World Bank 2008b).

Existing analyses tell us that the impacts of higher food prices on poverty are likely to be very diverse, depending upon the reasons for the price change and on the structure of the economy (Hertel and Winters 2006; Ravallion and Lokhsin 2005). A great deal depends on the distribution of net buyers and net sellers of food among low-income households (Aksoy and Isik-Dikmelik 2007). Only with careful examination of outcomes at the household level is it possible to tell whether changes in the prices of specific staple foods will help or hurt poor people.

A particular reason for concern about the impacts of high food prices on poor countries arises from the fact that the poorest people spend roughly three quarters of the

incomes on staple foods (Cranfield, Preckel and Hertel 2007). On the other hand, the incomes of farm households—frequently one of the poorest groups in low-income countries—may be increased by higher commodity prices (Hertel, Ivanic, Preckel and Cranfield 2004). However, the benefits of higher food prices to poor farm households may be less than they might at first appear, since these benefits depends not on what they produce, but on their net sales of these goods.

In this study, we attempt to address the main implications of higher food prices on poverty following the methodologically simple yet data-intensive approach of calculating the short-run impacts on households' income and costs of living following the changes in food prices. We do so using household surveys containing at least a thousand households in each of nine low-income countries, for which the data on consumption and production of the main food commodities are available. Besides calculating the change in household real income, we also estimate the impact of food prices on poverty rates and poverty gaps.

We consider two experiments in this paper. First we estimate the importance of small changes in the prices of individual commodities on poverty rates in each of our sample countries. We do so by conducting a stylized simulation in which we increase individual prices by 10 percent to assess the effect of a small change in the price of each commodity. Second, we estimate the impact of the actual food price changes between 2005 and 2007 on poverty in our sample of countries. In the initial analysis, we assume that changes in international prices are fully transmitted into domestic markets, and consider only the direct impacts of commodity price changes. We also consider scenarios under which commodity price changes lead to changes in the wage rate for unskilled labor—the other key source of income for most low-income households identified in Ravallion (1990).

2 Methodology

In this study, we consider some of the welfare and poverty impacts of changes in the world prices of key staple food commodities. Basic food commodities that are traded globally and are important for small farmers and consumers in the developing world include wheat, rice, dairy products, maize, sugar, beef and poultry. We analyze the impacts of changes in the prices of these commodities using household-level data for nine low income countries.

To undertake the analysis, we needed information on households' production, purchases, own-consumption and sales of these agricultural products, a need that limited us to countries with high-quality household surveys containing this information. This need also precluded using many of the models and databases prepared for the Hertel and Winters (2006) volume, since many of these did not include detailed information on enough of the commodities central to our analysis.

To assess the household impacts of changes in commodity prices, we use a very simple methodology based on Singh, Squire and Strauss (1986) and Deaton (1989; 1997, p185) (see Appendix A). We represent the impact of price changes on an individual household, using an expenditure function to characterize household consumption and factor supply behavior and a profit function to represent household production activities through unincorporated enterprises such as family farms. This yields a simple expression for the welfare impacts of small price changes that involves multiplying the price changes resulting from trade reform by the shares of income and expenditure affected by these price changes. Where a household consumes its own output of, for instance, staple foods, the share of the good's production in total output value is offset by its share in consumption so the only effect on income is through the household's net sales of the good.

Our framework is partial equilibrium in that we consider only the direct impacts of changes in the prices of staple foods on households, except that, like Ravallion (1990), we

also consider the potential impacts on poor households through induced changes in the wage rate for their net sales of unskilled labor. We ignore changes in the returns to skilled labor on the grounds that these returns make an extremely small contribution to the incomes of the poor. Our focus is on real price changes, and we ignore the potentially serious costs (Easterly and Fischer 2001; Ravallion and Datt 2002) imposed on the poor through the market disequilibria created by inflation. This omission seemed reasonable given that the average rate of inflation in developing countries[2] has been very moderate by historical standards until very recently. It averaged 5 percent in the period from 2000 to 2007 before rising to 7 percent by January 2007 and 8 percent in February 2008. However, to the extent that commodity price changes are contributing to inflation increases in developing countries, there may be some important additional costs—the Ravallion and Datt (2002, p389) estimate suggests that a rise in the inflation rate of three percentage points would increase the poverty headcount by 1.2 percentage points.

When we take into account impacts through changes in unskilled wage rates, we use national versions of the GTAP model to assess the short run impacts of changes in commodity prices on wage rates—essentially measuring the Stolper-Samuelson relationship between the prices of goods and the prices of factors. Given our short-run focus, we specify the standard specific-factors model of production, with capital fixed in each sector. Under our standard labor market closure, we assume that unskilled labor is mobile between agricultural and non-agricultural employment so that the benefits of an increase in demand for unskilled labor are shared between agricultural and non-agricultural workers. This assumption of mobility between agricultural and non-agricultural labor is supported by studies such as Bertrand and Squire's (1980) classic analysis of rural-urban labor mobility in Thailand. To assess the robustness of our results to this assumption, we examine in Appendix B a second

[2] Data from the World Bank's Projections Group (DECPG) were kindly provided by Hans Timmer.

labor market closure where the mobility of labor between agricultural and nonagricultural labor markets is very imperfect.

Consistent with many other studies considering the impacts of price changes on poverty (e.g. Chen and Ravallion 2004), we consider only the first-order impacts of food price changes on the poor. This seems a reasonable approach because the behavioral responses underlying the second-order effects we consider would need to be particularly large to change the direction of the effects we consider.[3] Demand elasticities for staple foods generally appear to be low (Tyers and Anderson 1992), and the scope for reducing consumption of staple foods in total when the prices of all these goods rise together is even less[4]. Most of the scope for making large quantity adjustments is on the supply side, where the scope for adjustment is less when many product prices rise together, and where major adjustments can take an extended period. The fact that commodity booms are typically short-lived (Deaton and Laroque 1992) further reduces the likelihood of large second-order impacts overwhelming the first order impacts on which we focus—unless producers believe that higher prices will be sustained for a longer period, they are unlikely to make the investments needed for substantial supply responses.

We also omit from consideration in all but our analysis from 2005 to the first quarter of 2008 any policy measures that might insulate poor net buyers of food from increases in the prices of staple foods. Clearly, such policies could reduce the impact of an increase in domestic prices of staple foods on poor consumers. However, the details of such programs are extremely important for their impact, with potentially substantial risks of incomplete coverage of the poor. Detailed studies of the operation of such policies would be important in

[3] Considering the net trade position of a household, or a country, reversal of the sign of the welfare impact requires that the net trade position be more than reversed when only the direct impacts of the price changes are considered. We relax this assumption in the empirical analysis by considering impacts through changes in the wage rate for unskilled labor.

[4] Although small changes in the consumption of near-subsistence households may generate large proportional changes in their net sales.

studies of individual countries. The results presented in this study indicate the effects on poverty in the absence of functioning schemes of this type.

In all of the analyses reported in this paper, we assume full transmission from world market prices to the prices facing producers and consumers, a finding supported by Mundlak and Larson (1992). The resulting poverty impacts will certainly be sensitive to this assumption. However, the nature of the impact will depend on the specific situation. In some countries, where many poor consumers are in areas strongly integrated with world markets, and net sellers are to some degree insulated, the impacts on poverty may be more adverse than under our assumption. By contrast, in other countries, consumers may be more insulated than producers, perhaps by consuming goods that are more strongly differentiated from imported goods, and the impacts on poverty may be more favorable than under our assumption. The extent and nature of price transmission should be taken into account when considering the actual impacts in particular countries.

We calculate the real income level after the change in food prices by adding the change in households' real incomes their initial income levels in order to find their real incomes after the price changes. By comparing the new achievable level of expenditure with the established poverty-line level of expenditure for each country, we are able to use individual survey records to identify and count the number of households in poverty and the gap between their income level and the poverty line after the change in policy. We then cumulate these shocks to see the impact on poverty, and compare these impacts with those prevailing when wages are also able to adjust. Finally, we use these data to calculate two complementary poverty measures (Ravallion and van der Walle 1991)—the poverty headcount and the poverty gap. The first measures the percentage of people falling below the poverty line and the second the average percentage of the poverty line by which the incomes of the poor fall below the poverty line relative to the poverty line.

3 The Data

For this study, we needed household survey information on supply, demand and net sales of food products—a constraint that narrowed the range of countries we could consider. We sought relatively poor countries from different regions, with different relationships between poverty and location, and between poverty and sources of income household; and with different net trade positions in agriculture. Because of the extremely rapid structural change in the Vietnamese economy, we obtained two observations at different periods.[5]

The sample sizes for each of the ten country-periods for which were able to obtain suitable, high-quality survey data are listed in Table 1. These were Bolivia 2005, Cambodia 2003, Madagascar 2001, Malawi 2004, Nicaragua 2001, Pakistan 1999, Peru 2003, Vietnam 1998 and 2004, and Zambia 1998. For our initial poverty rates and poverty gaps, we used the standard "dollar-a-day"[6] expenditure-based measures of poverty from the 2007 World Bank *World Development Indicators* (WDI). We ranked the households in our surveys by income and placed the poverty line at the income level that reproduced the poverty rate in the (frequently different) year used in the WDI. This process retains the survey information on the sources and distribution of income, while updating the poverty line to the most recent year for which information is available.

Because of the generally higher poverty rates in rural than in urban areas, the greater frequency of net seller households in rural areas, and the focus of this study on food prices, we categorized each household as either rural or urban based on the classification used in the national survey. For lack of information on urban versus rural costs of living, we have

[5] We would like to thank Carolyn Turk and Martin Rama for making available the 2004 data.

[6] According to this definition, a person is poor if he/she consumes less that 1.08 USD in 1993 Purchasing Power Parity terms. The years for the poverty lines by country were: Bolivia 2002, Cambodia 1997, Madagascar 2001, Malawi 2004, Nicaragua 2001, Pakistan 2002, Peru 2002, Vietnam 2002, and Zambia 2002-3

ignored these differences, which are potentially important for the level of poverty, but much less so for the changes in welfare levels on which we focus.

Figure 2 shows the net sales position as a share of total expenditures for each of these basic food commodities by rural and urban households in each income quintile. Fortunately, most of the products considered are traded in relatively raw form, and we added consumption of identifiable products such as bread to the consumption data for raw products such as wheat.[7] These figures for the groups near the poverty line are helpful in understanding our poverty results. However, they are not definitive in their effects on poverty, since the poor are very diverse and those on the threshold of poverty may have quite different characteristics from others in their overall income quintile. Figure 3 shows sales of unskilled labor as a share of total expenditures.

The initial poverty headcount and poverty gap numbers are presented in the first column of Table 2. The initial national poverty headcounts varied considerably between countries, from 75.8 percent in Zambia to 12.5 percent in Peru with the other six countries widely distributed in the intervening range. In almost all countries, the poverty headcount was higher in rural areas, with 40.8 percent of rural people poor on average, as against 24.5 percent of urban people.

The poverty gap numbers presented in the first column of Table 3 show that the gap between the incomes of the poor and the poverty line level of income for all people fell substantially below the poverty line. On average, this gap was 18.0 percent of the poverty line for rural people, 10.7 percent for urban people and 14.6 percent overall. In Madagascar it was 30.4 percent overall and in Zambia 44.7 percent, and in the country with the lowest poverty

[7] The price of bread includes returns to other inputs, and so may move less than proportionately with wheat prices. However, the prices of the types of bread consumed by poor people in poor countries tend to be more closely linked to wheat prices. Further, inclusion of bread seemed preferable to its exclusion.

gap, Pakistan, it was 4.0 percent. In all cases but Zambia, the poverty gap was larger in rural than in urban areas.

4 Experiments

4.1 Impacts of 10 price increases

In the first experiment, we consider two analyses in a small, open-economy setting. The first examines the direct impact of hypothetical 10 percent increases in the prices of individual products on both the poverty headcount and the poverty gap—the gap between the incomes of the poor and their poverty-line income. The second considers the impact of the same changes, taking into account their effects on wage rates for unskilled workers.

The specification of 10 percent price increases in experiments one and two do not imply that food prices are expected to rise by 10 percent (or any other amount). Rather, we examine the impact of a uniform change in the prices of these goods to get an indication of the direction and relative order of magnitude of effects for particular commodities. Correctly interpreted, the results of these experiments provide vitally important information because they summarize all the relevant information in our household survey database on the sources of income and the patterns of expenditure for each household. If, for instance, a large number of poor people in a particular country are net sellers of wheat, this experiment will tell us how much a 10 percent increase in the price of wheat will raise their incomes, and whether the gains to these households are large enough to offset losses to poor net-buying households so that national (and rural/urban) poverty rates fall.

In these initial analyses, we are able to sidestep the vexed question of the extent to which domestic and imported goods are substitutes, at least for the direct impacts through commodity prices. When we are examining the direct impact of a 10 percent change in the domestic price, it does not matter whether the domestic and imported goods are perfect or imperfect substitutes. The results without wage impacts from these experiments may be more

relevant in the short term since, as shown in Ravallion's (1990) study of Bangladesh rice pricing policy, the short-run effect on wages of food price changes may be considerably smaller than the long run impact.

4.2 Impacts of higher food prices on poverty

In the second scenario, we consider the impact of the recently observed food price increases on poverty. The scenario again includes the same set of agricultural commodities as before with the exception of beef and sugar, whose prices did not change much between 2005 and 2007. For the remainder of the commodities, we obtained the average annual prices from the FAO website and calculated rough percentage changes over this two-year period. The imprecise and rounded estimates are the result of the existence of various varieties of the same commodity and different prices at various points of sale. However, because the prices of similar commodities changed at a roughly the same rate, our scenario broadly captures the overall development of the relevant food commodities in the reference period. The price changes considered in this scenario are shown in Table 4.

5 Results

5.1 Impact of a 10 percent increase in food prices

In this analysis, we first considered the direct impacts of changes in the prices of the commodities, and then the combined effect of changes in the prices of commodity prices and induced changes in wages.

5.1.1 Commodity Price Impacts

The results presented in Table 2 show the impacts on poverty rates of raising the prices of particular goods by 10 percent from their initial levels. These results are shown first for the individual commodities and then for all commodities amongst the products considered. Corresponding results are presented in Table 3 for the poverty gap.

The results presented in Table 2 show that the impact of changes in each product price on poverty differs greatly between products and countries. In Bolivia, wheat and beef have the largest impact on poverty rates. For wheat, the increase in poverty is greater in rural than in urban areas, a finding consistent with its larger share in Figure 1. For all products except maize, poverty would increase. For maize, the reduction in poverty is concentrated in rural areas, and is very small relative to the increases in poverty associated with rising prices for other commodities.

In Cambodia, the commodity for which price changes have the greatest impact on poverty is rice, for which an increase of 10 percent raises national poverty rates by 0.5 percentage points—and increases poverty in both rural and urban areas. Beef price increases lower rural and national poverty rates, a result consistent with the importance of beef sales for people around the poverty line in Figure 1.

In Madagascar, the poverty rate is much more sensitive to the price of these staple foods. Increases in the price of rice raise poverty substantially, a result consistent with the importance of rice in the purchases of the poor in urban and rural areas. Increases in the price of beef raise poverty because many urban people near the poverty line are net buyers of beef. The effect of a 10 percent increase in the prices of the imported goods considered is to raise poverty by 1.8 percentage points.

For Malawi and Zambia, the most influential individual commodity is maize, for which Figure 1 shows both urban and rural households are net buyers so that an increase in its price raises poverty both in rural and in urban areas. Increasing the price of maize by ten percent would raise poverty in Zambia and Malawi by 0.8 and 0.5 percent in rural areas, 0.2 and 0.3 percent in urban areas, and 0.5 percent nationwide in both cases. When the prices of all staples increase by 10 percent, poverty rises by 0.6 and 1.1 percent in the rural areas, 0.4

and 0.6 percent in the rural areas for the total increase of 0.5 and 0.8 percent in Malawi and Zambia, respectively.

Nicaragua is like Madagascar in having much higher poverty impacts from increases in the prices of these staple foods than other countries. If the prices of all goods considered rose by 10 percent, the poverty rate would rise by 2.1 percent. In contrast with Madagascar, however, a large number of products contribute to this overall increase, with rice, dairy products, poultry and wheat having larger impacts than other commodities. The adverse impacts on poverty tend to be smaller in rural areas, and increases in the price of maize reduce rural poverty, while raising it nationally.

In Pakistan, there are sharp contrasts between the impacts on rural and urban poverty. Increases in the prices of rice, dairy products and wheat lower poverty in rural areas, while raising it in urban areas, and have very small impacts on national poverty rates. Increases in the prices of all goods lower rural poverty slightly, but the increase in urban poverty outweighs this and generates an increase of 0.3 percentage points in the national poverty rate.

In Peru, the effects of most commodity price changes on poverty are smaller than in most other countries. Beef, for which both urban and rural households are net sellers, has the largest absolute impact, with an increase in beef prices lowering the poverty rate in both urban and rural areas by 0.1 percentage points. Since both urban and rural households are net sellers of wheat, increases in its price raise poverty slightly so the impact of increases in all of the commodities considered is an extremely small reduction in poverty of 0.1 percentage points.

In Vietnam, both in 1998 and in 2004, the largest single commodity impact was through the price of rice, for which a 10 percent price increase cut rural poverty by 0.8 percentage points in 1998 and 1.0 percent in 2004. Urban poverty rises by 0.2 percentage points in each case, but the overall effect was a decline of 0.5 percentage points in the

national poverty rate using 1998 data and 0.7 percent using 2004 data. These results support the finding of Edmonds and Pavcnik (2005) that increases in rice prices would reduce poverty, and is more optimistic than the finding by Minot and Goletti (2000, pxiii and p64) that an increase in rice prices would lower rural poverty rates, but raise national poverty rates slightly in Vietnam. A key influence on these findings appears to be the relatively egalitarian distribution of land in Vietnam, and the absence of a large class of poor landless laborers (Ravallion and van der Walle 2008). In both years, increases in the price of poultry reduce poverty, and the size of this favorable impact doubled between 1998 and 2004, from 0.1 percent to 0.2 percent.

The overall average poverty impacts presented at the bottom of Table 2 show that, on average, increases in the prices of all of the commodities considered would increase poverty. The increases in urban poverty are generally larger than those in rural areas—unsurprisingly, since it is much less likely that urban households will be net sellers of these goods. For all commodities except beef, price increases raise both rural and urban poverty.

The results for changes in the poverty gap in Table 3 complement the estimates for the poverty rate by taking into account the depth of poverty. As for the poverty headcount, there are substantial differences in the effects by commodity and between rural and urban areas. However, the poverty gap numbers tend to be less volatile than the poverty rate impacts and, particularly, less affected by the initial poverty rate. In terms of the overall average, the picture is very similar to that discussed above for the poverty rate. Increases in the prices of all of these staple foods increase the poverty gap more in urban than in rural areas, but increase the poverty gap in both, and raise the national poverty rate. The one exception at the commodity level is beef, for which price rises reduce the poverty gap both in rural areas and nationally, albeit by a small amount.

In Bolivia, the impacts on the poverty gap arise from a number of commodities, including wheat, rice and sugar although the impacts through the price of wheat are by far the largest. By contrast, in Cambodia and in Madagascar, the overall effects are dominated by rice, as would be suggested by Figure 1. Ten percent increases in the price of rice in these two countries raise the poverty gap by 0.6 and 0.7, contributing more than the total increase in the poverty gap. In Nicaragua, as in Bolivia, a wide range of commodities contribute to the increase in the poverty gap, with rice and dairy products having the largest impact. An increase in the price of wheat has the most marked adverse impact on the poverty gap in Pakistan, with a 10 percent increase in the price of wheat increasing the poverty gap by 0.1.

Peru is quite different in that the poverty gap falls when the prices of these commodities rise, with most of the reduction of 0.1 percentage points coming from beef. In Vietnam the poverty gap falls when prices of all commodities considered rise, an effect dominated—as was the case with the poverty rate—by rice. In Malawi, increases in virtually all commodity prices raise the poverty gap, with the most influential case being maize, which contributes 0.2 out of the overall national increase in the poverty gap of 0.2 percent.

5.1.2 Commodity Price and Wage Impacts

In Tables 2 and 3 we also consider the impact of changes in commodity prices accompanied by changes in unskilled wage rates. The results in Table 2 show that labor market effects can be important in determining the impact of price changes on poverty rates. When the prices of all goods rise by 10 percent, the resulting average increase in rural poverty falls from 0.5 percent, when wage impacts are ignored, to 0.3 percent with wage impacts included. For some countries, such as Nicaragua, the incorporation of wage impacts has very little impact. For others, such as Pakistan, the effect on the poverty rate is sharply reduced when all commodities are considered. However, in no case is the sign of the overall effect changed.

At the individual commodity level, there is somewhat more diversity in the effect of including wage rate impacts. In a few cases wage rate impacts are sufficient to change the direction of the effect on national poverty rates. This is the case for beef in Madagascar, where the poverty impact changes from 0.4 to -0.1 percentage points. But these effects are very small and increases in the prices of all of these staple goods continue to raise national poverty rates.

The results in Table 3 reveal a very similar picture for the poverty gap. In most cases, increases in prices increase the poverty gap. A 10 percent increase in the prices of all goods would reduce the poverty gap under our assumptions only in Peru and in Vietnam. For the sample of countries as a whole, the effect of increasing the prices of all considered goods by 10 percent with the inclusion of wage impacts would raise the poverty gap by an average of 0.3 percentage points in rural areas, by 0.2 in urban areas, and by 0.2 percentage points overall.

5.2 Impact of the 2005-7 global food price increases on poverty

In the second experiment, we consider the developments in global food prices in 2005-2007 and apply these changes to our sample of households in order to estimate the impact on poverty in the absence of policy responses. Based on the FAO data on price developments, we implement the scenario shown in Table 4. Following Mundlak and Larson (1992), we assume that price transmission between world and domestic markets is approximately complete under normal market circumstances and specify a unitary elasticity of price transmission.

We first consider a scenario with wage impacts ignored. The main poverty rate change results of this scenario are shown in Table 5. As the table suggests, the average impact of the past global food price increase results in a rise in poverty of 3.0 percentage

points. The increase among the urban households is greater, at 3.6 percentage points, while rural poverty rises by 2.5 percentage points.

The table also suggests that even though the average impact of recent food price developments is adverse, two countries—Vietnam and Peru—would likely have benefited from reductions in rural poverty. In the case of Vietnam 2004, the reductions in rural poverty are large enough to reduce overall poverty, even though urban poverty rates rise slightly. Looking at the poverty impacts of individual commodities, we can see that in the case of Peru rural households benefit from the rising price of almost all commodities with the exception of wheat. In the contrasting case of Vietnam, essentially all of the poverty reduction comes from the rise in the price of rice.

The country whose poverty would have the most adversely impacted by the rise in food prices appears to be Nicaragua, especially its urban households. The overall poverty rate in Nicaragua would have risen by 7.8 percent under this scenario, while the urban poverty rate would have risen by 10.7 percentage points. The by-commodity decomposition of this poverty result shows that urban households tend to spend a large share of their income on purchases of the food products we consider, as Figure 1 also suggests.

Table 6 presents the corresponding changes in poverty gaps following our simulation. Its results are broadly consistent with the poverty rate results in Table 5. The poverty gap rises in all countries but Peru and Vietnam. In Peru, the major source of the reduction in the poverty gap is the increase in prices of maize. By contrast, in Vietnam, the most important determinant of the result is wheat. In all other country-periods, the poverty gap rises.

When wage impacts are also considered in our calculations, the results become less adverse for poverty outcomes, as unskilled wages rise in response to the increase in commodity prices, but the signs of the effects are generally not reversed. By including wage impacts, the average increase in the poverty rate drops from 3.0 percentage points to 2.7.

Similarly, the urban poverty change drops from 3.6 to 3.2 and rural poverty from 2.5 to 2.2 percentage points. The impact on the poverty gap follows the same pattern of ameliorating the results without changing their conclusions.

Table 5 is also allows us to consider the importance of each commodity price change on the overall changes in poverty. The prices of maize and wheat appear to have played the most prominent role in poverty increase, contributing 0.9 percent. The price increases of rice and dairy contributed additional 0.3 and 0.5 percentage points. The overall impact of the price of chicken is zero because it as often increases poverty as it decreases it. Turning to the poverty gap numbers in Table 6, we see that the commodities with the greatest leverage on the results are maize, wheat and rice, which raise the poverty gap by 0.7 percent, 0.4 percent and 0.3 percent respectively.

6 Robustness Checks

The results of our robustness checks are presented and discussed in detail in Appendix B and only briefly summarized here. The first robustness check was to investigate possible nonlinearities in the relationship between the size of the price change and the poverty outcome, to see whether the results obtained could be scaled up or down to gain a broad indication of the effects of other price changes. The results of this analysis suggest that the results can be scaled up or down to give a reasonably reliable indication of the effects of reasonably small price changes.

Our second robustness check examined different possible settings of the poverty rate. Given the wide range of possible different poverty lines we needed to be sure that our results were not strongly sensitive to the choice of poverty line. As expected, the level of the poverty line affected the magnitude of the percentage point changes in poverty rates for changes in staple food products. However, only in one case, Pakistan, was there a change in the sign of

the effect, and only when raising the poverty line from its initial 17 percent to over 65 percent of the population.

Our final robustness check considered the impact of moving from a labor market in which unskilled labor is reasonably mobile between rural and urban employment, and a strongly segmented labor market specification based on parameters estimated for China, where there are formal barriers to mobility such as the residence permit system. Under the strongly segmented labor market assumption, rural unskilled wages rose much more than urban wages in response to increases in agricultural prices, and rural poverty rates rose less with a single labor market. However, urban poverty rose by more, and the impact on national poverty rates was essentially the same.

7 Concluding Remarks

Our study has attempted to shed some light on the important linkages between higher global food prices and poverty. By applying a simple approach of calculating the first-order welfare changes of households covered in ten detailed surveys, it was able to provide a very detailed assessment of the impact of higher food prices on national welfare and poverty in the sample of the countries. Even though the methodology employed in the study is simple, it is powerful enough to give us a good understanding of the underlying mechanisms and the expected magnitude and direction of change of the poverty rate of the developing countries resulting from the changes in the global food prices.

The findings of the study suggest that the overall impact of higher food prices on poverty is generally adverse. Despite certain variation by commodity and by country, the fact is that most poor are net consumers of food and as such tend to be hurt by higher food prices. This conclusion is much more obvious for urban households where farming is much less dominant. Even though many rural households gain from higher food prices, the overall impact on poverty remains negative.

These findings are reinforced by the results of the second simulation undertaken in this study, where we calculated the impact of the observed increases in the global food prices over the period of 2005 to 2007. Again, we discovered that the average impact of this development was to increase poverty for a majority of the countries covered in our sample, mainly due to the negative impact of higher wheat prices, followed by the prices of rice, dairy and maize. There was considerable variation among countries and the types of households in both the impacts of a given commodity price change, and in the effect of the particular constellation of price changes considered over the 2005-7 period. While there were a few cases where higher commodity prices lowered rural poverty, in most cases poverty—even rural poverty—increased, and the overall sample average poverty impact was clearly adverse. A number of robustness checks are reported in Appendix B. The first of these examines the effect of changing the size of the shock. A second considers the sensitivity of the results to changes in the poverty line. A third examines the implications of a segmented labor market, with strong resistance to movement of unskilled labor between agricultural and non-agricultural employment. These robustness checks lead to some changes in specific results, but leave unchanged the broad conclusion that increases in prices of most of the staple foods considered will much more frequently increase, rather than reduce, poverty in low-income countries.

Our analysis includes some households who are net buyers and some which are net sellers of the staple foods considered. While it is possible that higher prices of staple foods could lower poverty by raising the incomes of some poor farmers, this effect was, in most cases we considered, offset by adverse impacts on poor households that were net buyers of food.

A key current policy question is the impact of the current commodity price surge on global poverty. While detailed information on a large group of countries is not available, we

can use the analysis developed in this paper to guide some back-of-the-envelope calculations. First, the change in prices—prices have continued to rise since end-2007 through the first quarter of 2008, to yield even larger price "shocks" then those shown in Table 5. Second, these price changes were adjusted to allow for the decline in the dollar relative to the currencies of our sample countries, and for inflationary effects. Third, we reduced the price changes to adjust for barriers to transmission of changes between domestic and international prices, using 66 percent as a "guesstimate" of the average value of this parameter[8] for low-income countries.

With these assumptions, we can assess the impacts on poverty in each sample country taking into account both increases in commodity prices and estimated impacts on unskilled wage rates relative to other prices. The simple average of the estimated effects on national poverty rates (US$1/day) in this nine-country sample is an increase of 4.5 percentage points. Applying this average result to all low-income countries translates into an increase in the poverty headcount of 105 million people (out of the low-income population of 2.3 billion). Alternatively, as the rate of poverty reduction has averaged 0.68 percent annually since 1984, a 4.5 percent increase in the poverty headcount corresponds to a loss of almost seven years of poverty reduction.

While any such back-of-the envelope calculation must be treated with great caution, there seem to be good reasons to be concerned about the potentially adverse impacts of large changes in world food prices for poverty in poor countries. The high shares of staple foods in the expenditures of poor people increase their vulnerability to food price rises, while the limited share of output marketed by small, subsistence farmers reduces their benefits. There

[8] While the evidence on the value of this parameter is limited, Dawe (2008) found an average of 51 percent transmission from world to domestic prices between 2003(Q4) and 2007(Q4) for a sample of Asian countries, including countries such as India and the Philippines, where policies have typically sought to insulate domestic prices from world market price shocks.

are many possibilities for mitigation of these poverty impacts—many of which are currently being explored by governments and the development community—but there are also risks that the full costs could be even greater, particularly if the surge in food and energy prices is transmitted into higher overall inflation rates.

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Table 1: Sample sizes for the household surveys

	Rural	Urban	Total
Bolivia (2005)	1,750	2,335	4,085
Cambodia (2003)	11,990	2,994	14,984
Madagascar (2001)	2,036	3,039	5,075
Malawi (2004)	9,840	1,440	11,280
Nicaragua (2001)	1,790	2,211	4,001
Pakistan (1998-99)	10,254	5,909	16,163
Peru (2003)	3,638	1,378	5,016
Vietnam (1997-98)	4,269	1,730	5,999
Vietnam (2004)	6,938	2,250	9,188
Zambia (1998)	8,373	8,170	16,543
Total	60,878	31,456	92,334

Table 2: Initial $1 per day Poverty rates and impacts of a 10 percent price increase on poverty, % and % points change.

			Beef		Dairy		Maize		Poultry		Rice		Sugar		Wheat		All	
		Initial	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW
Bolivia	Rural	40.9	0.2	0.2	0.0	-0.1	-0.1	-0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.5	0.4
	Urban	9.9	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.2	0.2	0.6	0.6
	Total	23.2	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.5	0.5
Cambodia	Rural	38.7	-0.3	-0.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.6	0.5	0.1	0.1	0.0	0.0	0.3	0.1
	Urban	15.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.4	0.0	0.0	0.0	0.0	0.5	0.2
	Total	34.1	-0.2	-0.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.5	0.5	0.0	0.0	0.0	0.0	0.3	0.1
Madagascar	Rural	76.8	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.4	0.2	0.1	0.0	0.0	1.9	1.4
	Urban	50.4	0.5	-0.2	0.2	0.2	0.0	0.0	0.1	0.0	1.2	0.7	0.1	-0.1	0.3	0.3	1.8	0.2
	Total	61.0	0.4	-0.1	0.1	0.1	0.0	0.0	0.0	0.0	1.4	1.0	0.1	0.0	0.2	0.2	1.8	0.7
Malawi	Rural	23.3	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.6	0.5
	Urban	3.7	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.3
	Total	20.8	0.0	0.0	0.0	0.0	0.5	0.4	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.5	0.5
Nicaragua	Rural	61.1	0.1	0.0	0.2	0.2	-0.2	-0.2	0.2	0.1	0.4	0.4	0.2	0.2	0.4	0.4	1.5	1.4
	Urban	32.2	0.2	0.2	0.6	0.6	0.1	0.1	0.5	0.5	0.5	0.5	0.2	0.2	0.2	0.3	2.7	2.5
	Total	45.1	0.1	0.1	0.4	0.4	0.0	0.0	0.4	0.3	0.4	0.5	0.2	0.2	0.3	0.3	2.1	2.0
Pakistan	Rural	20.8	0.0	0.0	-0.1	-0.3	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.3
	Urban	10.4	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.4	0.8	0.8
	Total	17.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.1	0.1	0.3	0.1
Peru	Rural	12.9	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
	Urban	11.5	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
	Total	12.5	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
Vietnam 2004	Rural	20.9	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-1.0	-1.1	0.0	0.0	0.0	0.0	-1.4	-1.5
	Urban	7.6	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0
	Total	17.7	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.7	-0.8	0.0	0.0	0.0	0.0	-1.0	-1.1
Vietnam 1998	Rural	21.6	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.8	-1.0	0.0	0.0	0.0	0.0	-0.9	-1.1
	Urban	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.3	0.2
	Total	17.7	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.5	-0.7	0.0	0.0	0.0	0.1	-0.6	-0.7
Zambia	Rural	72.2	0.0	0.0	0.0	0.0	0.8	0.8	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.1	1.1
	Urban	79.5	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5
	Total	75.8	0.1	0.0	0.0	0.0	0.5	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
Average	Rural	40.8	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.5	0.3
	Urban	24.5	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.2	0.1	0.0	0.1	0.1	0.8	0.5
	Total	34.1	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.6	0.4

Note: NW-no wage impacts included, WW-results with wage impacts; average excludes Vietnam 1998

Table 3: Initial $1 per day poverty gap and impacts of a 10 percent increase in prices, % and % points change.

			Beef		Dairy		Maize		Poultry		Rice		Sugar		Wheat		All	
		Initial	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW
Bolivia	Rural	15.2	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.3	0.2
	Urban	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2
	Total	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2
Cambodia	Rural	11.4	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0	0.6	0.5
	Urban	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.2	0.1
	Total	10.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	0.0	0.0	0.0	0.0	0.5	0.4
Madagascar	Rural	43.0	-0.2	-0.4	0.0	0.0	0.0	0.0	-0.1	-0.1	0.8	0.7	0.1	0.1	0.1	0.1	0.7	0.4
	Urban	22.0	0.1	-0.3	0.0	0.0	0.0	0.0	0.0	-0.1	0.6	0.3	0.1	0.0	0.1	0.1	1.0	0.1
	Total	30.4	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-0.1	0.7	0.5	0.1	0.0	0.1	0.1	0.9	0.2
Malawi	Rural	7.7	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
	Urban	1.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Total	6.8	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Nicaragua	Rural	25.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.3	0.3	0.2	0.2	0.1	0.1	0.8	0.8
	Urban	10.6	0.1	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.9	0.8
	Total	17.1	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.9	0.8
Pakistan	Rural	4.8	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
	Urban	2.4	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2
	Total	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Peru	Rural	5.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
	Urban	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
	Total	5.2	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
Vietnam 2004	Rural	6.2	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.3	-0.3	0.0	0.0	0.0	0.0	-0.4	-0.4
	Urban	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	0.0	0.0	0.0	0.0	-0.3	-0.3
Vietnam 1998	Rural	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.3	-0.3	0.0	0.0	0.0	0.0	-0.4	-0.4
	Urban	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
	Total	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	0.0	0.0	0.0	0.0	-0.2	-0.3
Zambia	Rural	43.5	0.0	0.0	0.0	0.0	0.5	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
	Urban	45.8	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.5	0.3
	Total	44.7	0.1	0.0	0.0	0.0	0.3	0.3	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.6
Average	Rural	18.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.3	0.3
	Urban	10.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.2
	Total	14.6	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3	0.2

Note: NW-no wage impacts included, WW-results with wage impacts; average excludes Vietnam 1998

Table 4: World price scenario for 2005-7

	Price change %
Beef	0
Dairy	90
Maize	80
Poultry	15
Rice	25
Sugar	0
Wheat	70

Source: FAO

Table 5: Poverty rate impacts of 2005-7 global food price increases, % and % points change.

			Beef		Dairy		Maize		Poultry		Rice		Sugar		Wheat		All	
		Initial	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW
Bolivia	Rural	40.9	0.0	0.0	0.3	0.0	-0.8	-0.8	0.2	0.1	0.2	0.2	0.0	0.0	2.5	2.5	1.9	1.6
	Urban	9.9	0.0	0.0	0.5	0.3	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.0	1.1	1.1	2.1	2.0
	Total	23.2	0.0	0.0	0.4	0.2	-0.3	-0.3	0.1	0.1	0.2	0.2	0.0	0.0	1.7	1.7	2.0	1.8
Cambodia	Rural	38.7	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	1.4	1.2	0.0	0.0	0.1	0.1	1.5	1.3
	Urban	15.7	0.0	0.0	0.0	0.2	0.0	0.1	0.1	-0.1	1.2	0.8	0.0	0.0	0.1	0.1	1.4	1.0
	Total	34.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.1	1.4	1.1	0.0	0.0	0.1	0.1	1.5	1.3
Madagascar	Rural	76.8	0.0	0.0	0.3	0.3	0.2	0.2	-0.1	-0.1	2.6	2.3	0.0	0.0	0.5	0.6	3.5	3.1
	Urban	50.4	0.0	0.0	0.8	0.6	0.3	0.3	0.1	0.0	2.5	1.4	0.0	0.0	1.7	1.7	5.6	3.9
	Total	61.0	0.0	0.0	0.6	0.5	0.2	0.3	0.0	0.0	2.5	1.8	0.0	0.0	1.2	1.3	4.7	3.6
Malawi	Rural	23.3	0.0	0.0	0.0	0.0	4.3	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	4.6	4.1
	Urban	3.7	0.0	0.0	0.0	0.0	2.8	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	3.3	3.0
	Total	20.8	0.0	0.0	0.0	0.0	4.1	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	4.4	4.0
Nicaragua	Rural	61.1	0.0	0.0	2.5	2.3	-0.5	-0.5	0.3	0.2	1.1	1.1	0.0	0.0	1.6	1.6	4.2	4.2
	Urban	32.2	0.0	0.0	4.2	4.1	2.6	2.6	0.6	0.5	1.7	1.7	0.0	0.0	2.1	2.1	10.7	10.5
	Total	45.1	0.0	0.0	3.4	3.3	1.2	1.2	0.5	0.4	1.4	1.4	0.0	0.0	1.8	1.9	7.8	7.7
Pakistan	Rural	20.8	0.0	0.0	0.2	-0.9	-0.2	-0.2	0.0	0.0	-0.2	-0.3	0.0	0.0	1.9	2.1	2.7	1.9
	Urban	10.4	0.0	0.0	2.8	2.5	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	2.7	2.7	6.5	6.1
	Total	17.0	0.0	0.0	1.1	0.3	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0	2.2	2.3	4.1	3.4
Peru	Rural	12.9	0.0	0.0	-0.2	-0.2	-0.2	-0.2	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	-0.4	-0.4
	Urban	11.5	0.0	0.0	0.1	0.0	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0
	Total	12.5	0.0	0.0	-0.1	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.2	-0.3
Vietnam 2004	Rural	20.9	0.0	0.0	0.1	0.0	-0.8	-0.8	-0.3	-0.4	-1.9	-2.1	0.0	0.0	0.0	0.0	-2.8	-3.1
	Urban	7.6	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.3	0.2	0.0	0.0	0.0	0.0	0.3	0.1
	Total	17.7	0.0	0.0	0.1	0.0	-0.6	-0.6	-0.3	-0.3	-1.4	-1.6	0.0	0.0	0.0	0.0	-2.0	-2.3
Vietnam 1998	Rural	21.6	0.0	0.0	0.1	0.0	-0.5	-0.5	-0.2	-0.3	-1.4	-1.7	0.0	0.0	0.3	0.3	-1.8	-2.2
	Urban	8.1	0.0	0.0	0.1	-0.2	-0.1	-0.1	0.1	-0.2	1.0	0.8	0.0	0.0	0.3	0.3	1.3	0.9
	Total	17.7	0.0	0.0	0.1	-0.1	-0.4	-0.4	-0.1	-0.3	-0.7	-1.0	0.0	0.0	0.3	0.3	-0.9	-1.3
Zambia	Rural	72.2	0.0	0.0	0.4	0.4	6.4	6.3	0.4	0.4	0.1	0.1	0.0	0.0	0.0	0.0	7.4	7.4
	Urban	79.5	0.0	0.0	0.5	0.4	1.8	1.5	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	2.5	2.3
	Total	75.8	0.0	0.0	0.4	0.4	4.1	4.0	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	5.0	4.9
Average	Rural	40.8	0.0	0.0	0.4	0.2	0.9	0.9	0.0	0.0	0.4	0.3	0.0	0.0	0.8	0.8	2.5	2.2
	Urban	24.5	0.0	0.0	1.0	0.9	0.8	0.8	0.1	0.1	0.7	0.5	0.0	0.0	0.9	0.9	3.6	3.2
	Total	34.1	0.0	0.0	0.7	0.5	0.9	0.9	0.1	0.0	0.5	0.3	0.0	0.0	0.8	0.9	3.0	2.7

Note: NW-no wage impacts included, WW-results with wage impacts; average excludes Vietnam 1998

Table 6: Poverty gap impacts of 2005-2007 global food price increase, % and % points change

			Beef		Dairy		Maize		Poultry		Rice		Sugar		Wheat		All	
		Initial	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW	NW	WW
Bolivia	Rural	15.2	0.0	0.0	0.2	0.1	-0.3	-0.3	0.0	0.0	0.1	0.1	0.0	0.0	1.3	1.3	1.4	1.2
	Urban	2.8	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.5	0.5	0.8	0.8
	Total	8.1	0.0	0.0	0.2	0.1	-0.1	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.8	0.8	1.1	0.9
Cambodia	Rural	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.8	1.7	0.0	0.0	0.0	0.0	1.8	1.8
	Urban	4.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.1	0.6	0.4	0.0	0.0	0.0	0.0	0.6	0.5
	Total	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	1.6	1.5	0.0	0.0	0.0	0.0	1.6	1.5
Madagascar	Rural	43.0	0.0	0.0	0.2	0.1	0.2	0.2	-0.1	-0.1	2.1	1.9	0.0	0.0	0.4	0.4	2.9	2.6
	Urban	22.0	0.0	0.0	0.4	0.2	0.1	0.1	0.0	-0.1	1.7	0.9	0.0	0.0	0.8	0.8	3.1	2.1
	Total	30.4	0.0	0.0	0.3	0.2	0.1	0.2	0.0	-0.1	1.9	1.3	0.0	0.0	0.6	0.7	3.0	2.3
Malawi	Rural	7.7	0.0	0.0	0.0	0.0	2.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.4	2.2
	Urban	1.1	0.0	0.0	0.0	0.0	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.9
	Total	6.8	0.0	0.0	0.0	0.0	2.1	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	2.2	2.0
Nicaragua	Rural	25.1	0.0	0.0	1.7	1.6	0.3	0.3	0.1	0.0	0.7	0.7	0.0	0.0	0.8	0.9	3.8	3.7
	Urban	10.6	0.0	0.0	1.8	1.8	1.1	1.1	0.1	0.1	0.5	0.5	0.0	0.0	0.8	0.8	5.0	4.9
	Total	17.1	0.0	0.0	1.8	1.7	0.8	0.7	0.1	0.1	0.6	0.6	0.0	0.0	0.8	0.8	4.5	4.4
Pakistan	Rural	4.8	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	1.5	1.3
	Urban	2.4	0.0	0.0	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	1.7	1.6
	Total	4.0	0.0	0.0	0.5	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	1.6	1.4
Peru	Rural	5.3	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
	Urban	4.9	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
	Total	5.2	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.1
Vietnam 2004	Rural	6.2	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.1	-0.1	-0.6	-0.6	0.0	0.0	0.0	0.0	-0.8	-0.9
	Urban	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
	Total	5.2	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.1	-0.1	-0.4	-0.5	0.0	0.0	0.0	0.0	-0.6	-0.7
Vietnam 1998	Rural	6.4	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.1	-0.1	-0.5	-0.6	0.0	0.0	0.1	0.1	-0.6	-0.7
	Urban	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.1	0.1	0.4	0.3
	Total	5.2	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	-0.3	-0.3	0.0	0.0	0.1	0.1	-0.3	-0.4
Zambia	Rural	43.5	0.0	0.0	0.4	0.4	6.1	6.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	7.1	7.0
	Urban	45.8	0.0	0.0	0.5	0.5	1.2	0.9	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	2.0	1.6
	Total	44.7	0.0	0.0	0.5	0.4	3.7	3.5	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.1	4.6	4.4
Average	Rural	18.0	0.0	0.0	0.3	0.3	0.9	0.9	0.0	0.0	0.5	0.4	0.0	0.0	0.4	0.4	2.2	2.1
	Urban	10.7	0.0	0.0	0.4	0.4	0.3	0.3	0.0	0.0	0.3	0.2	0.0	0.0	0.3	0.3	1.6	1.4
	Total	14.6	0.0	0.0	0.4	0.3	0.7	0.7	0.0	0.0	0.4	0.3	0.0	0.0	0.4	0.4	2.0	1.8

Note: NW-no wage impacts included, WW-results with wage impacts; average excludes Vietnam 1998

Figure 1: Annual average prices in USD per ton as reported by FAO

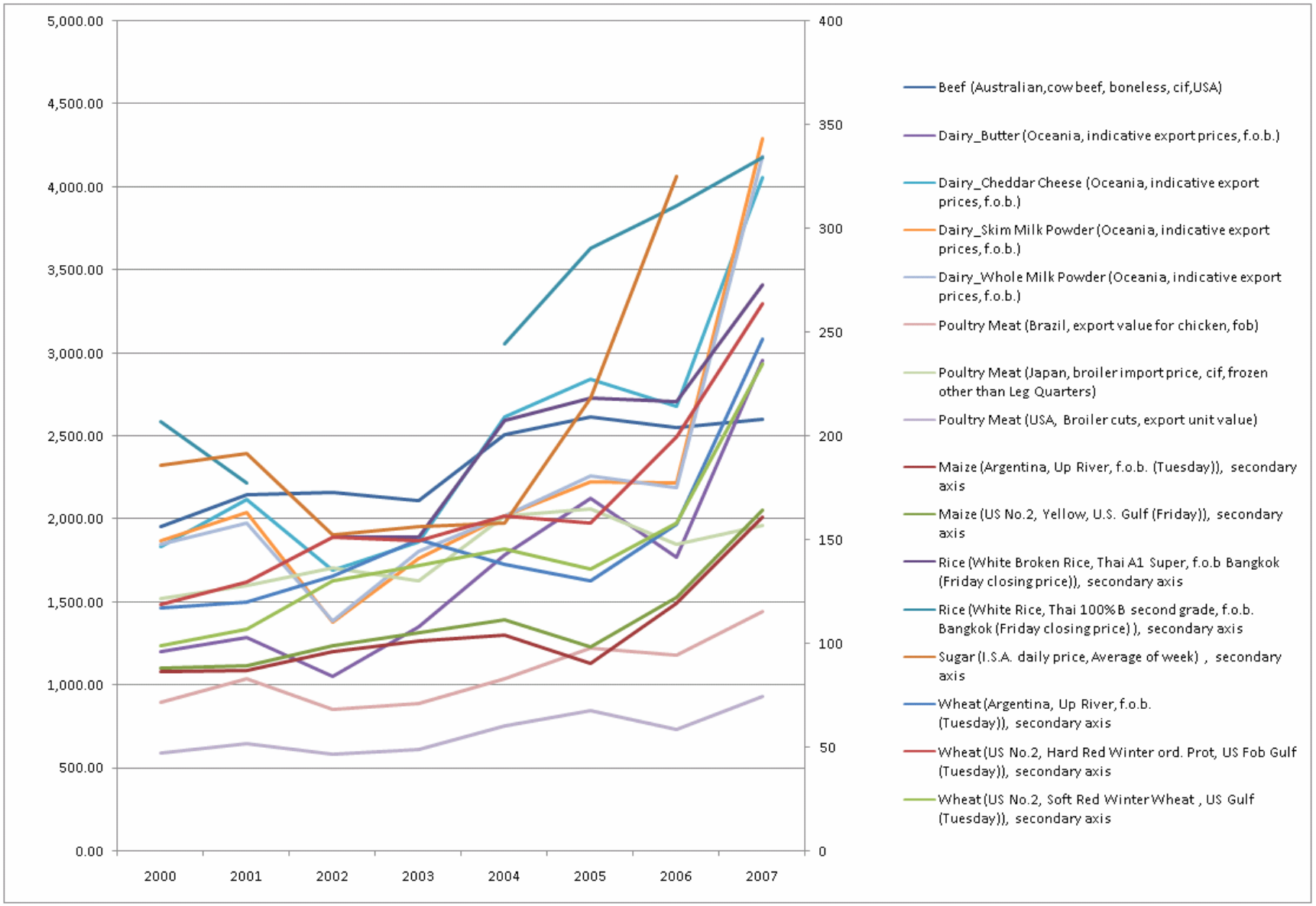
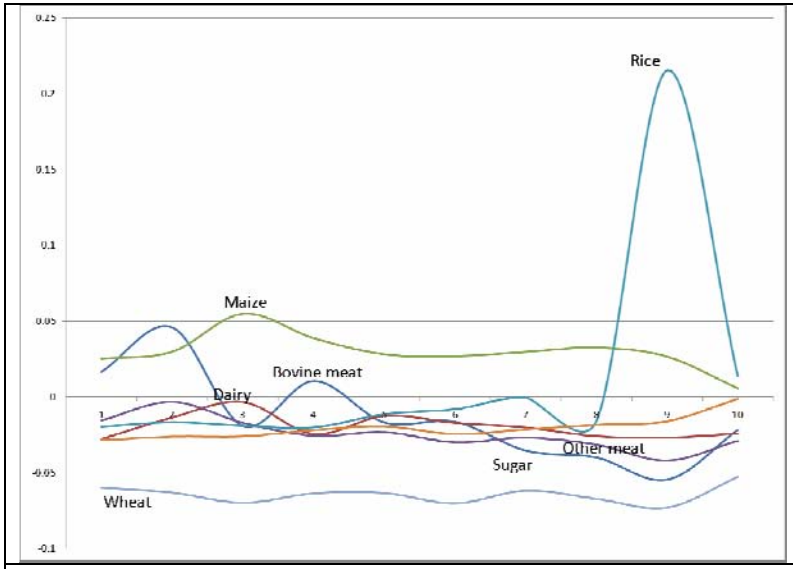
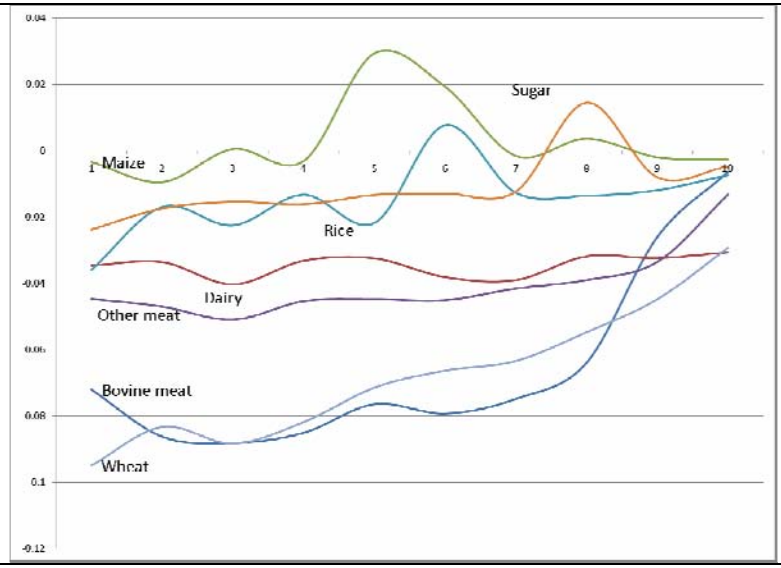


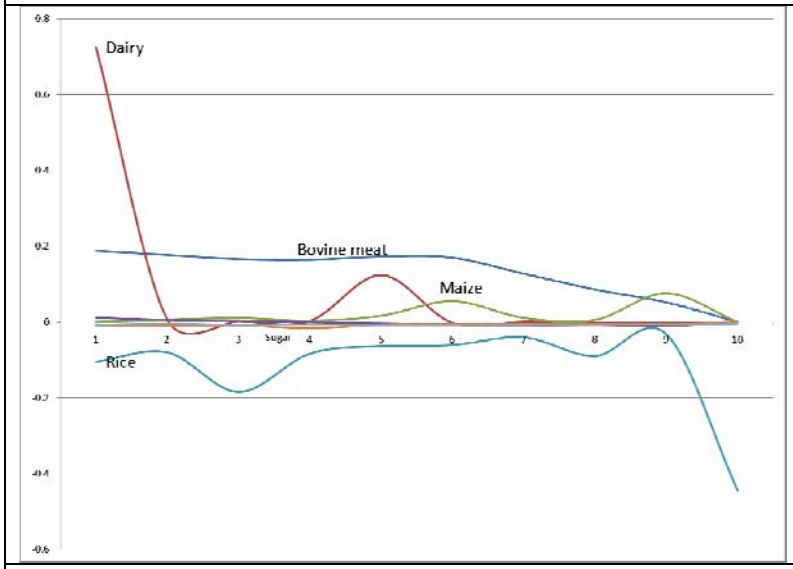
Figure 2. Sales of each commodity as a share of total expenditures, %



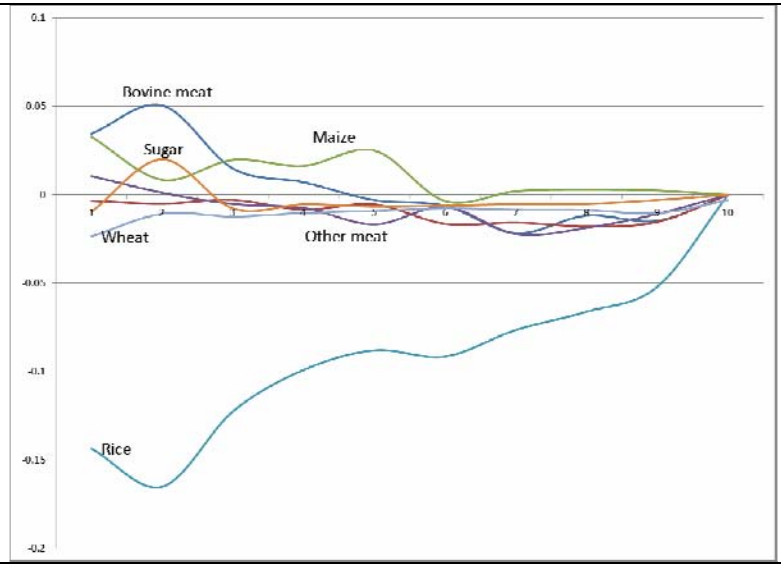
Bolivia Rural



Bolivia Urban

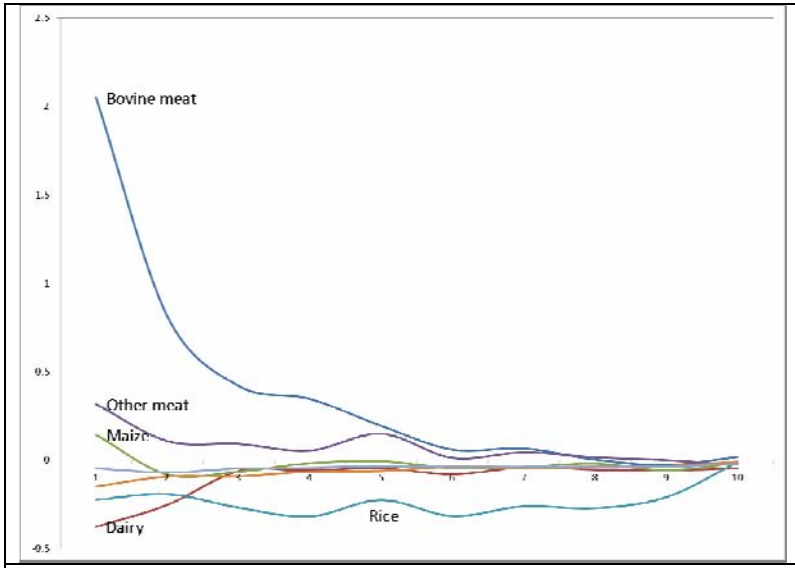


Cambodia Rural

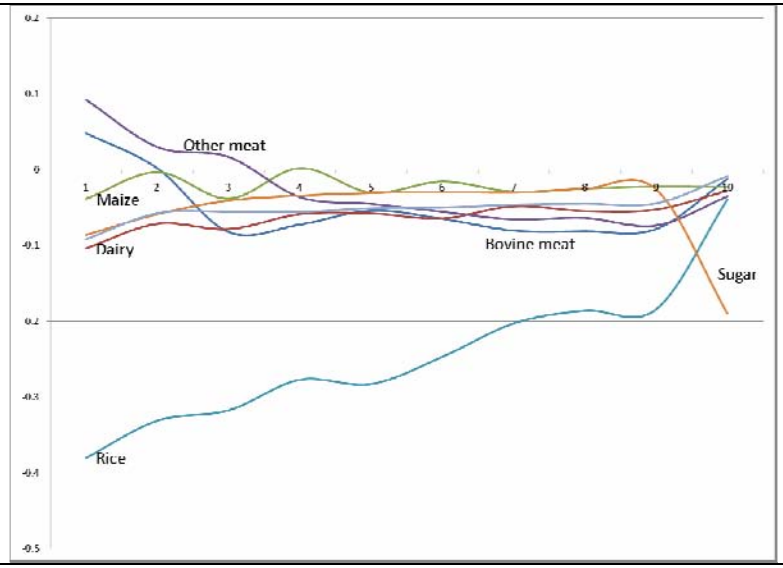


Cambodia Urban

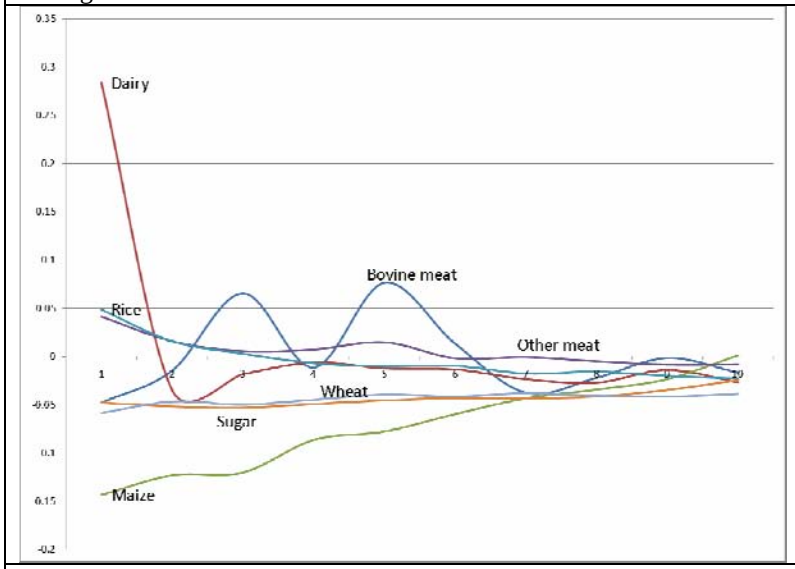
Figure 2: Sales of each commodity as a share of total expenditures, % (continued)



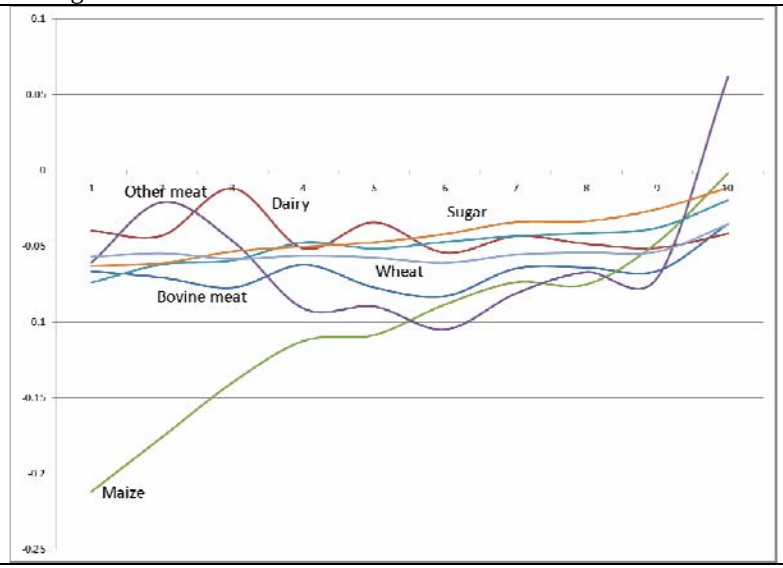
Madagascar Rural



Madagascar Urban

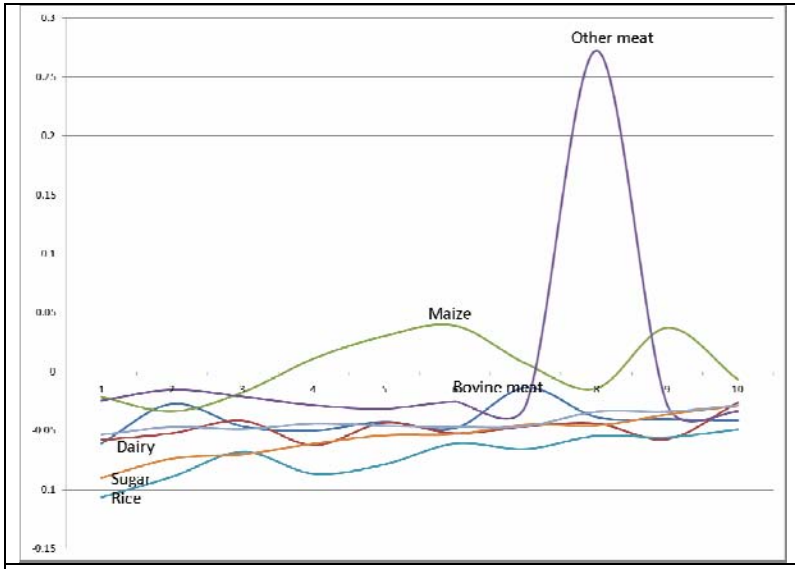


Malawi Rural

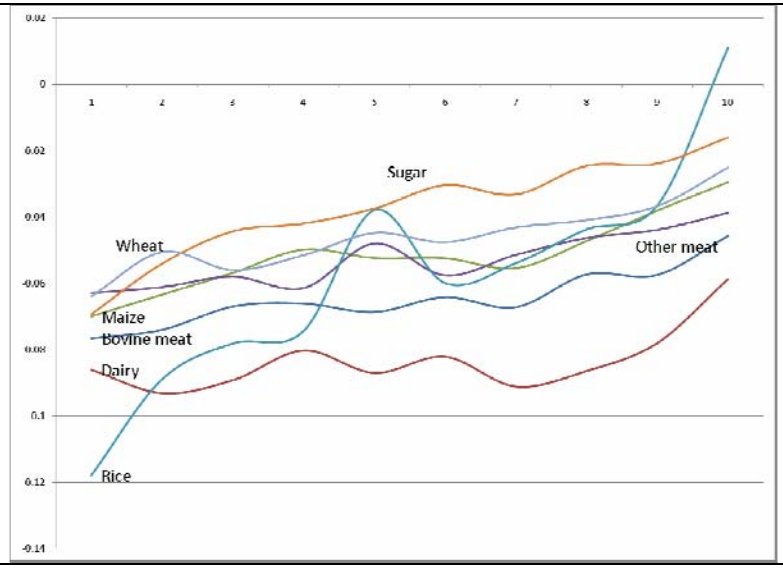


Malawi Urban

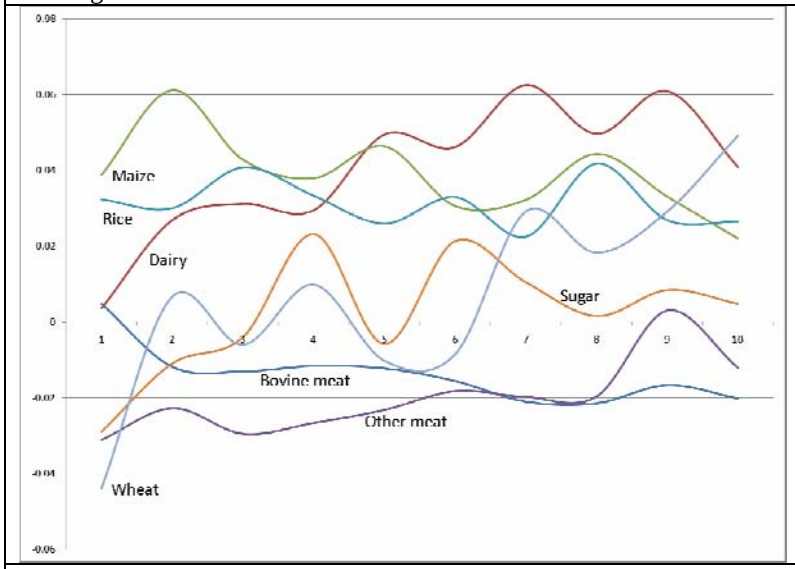
Figure 2: Sales of each commodity as a share of total expenditures, % (continued)



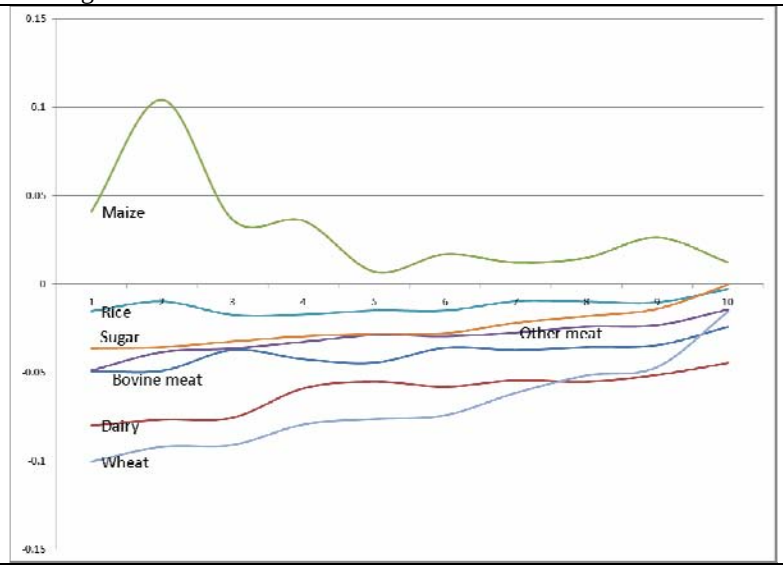
Nicaragua Rural



Nicaragua Urban

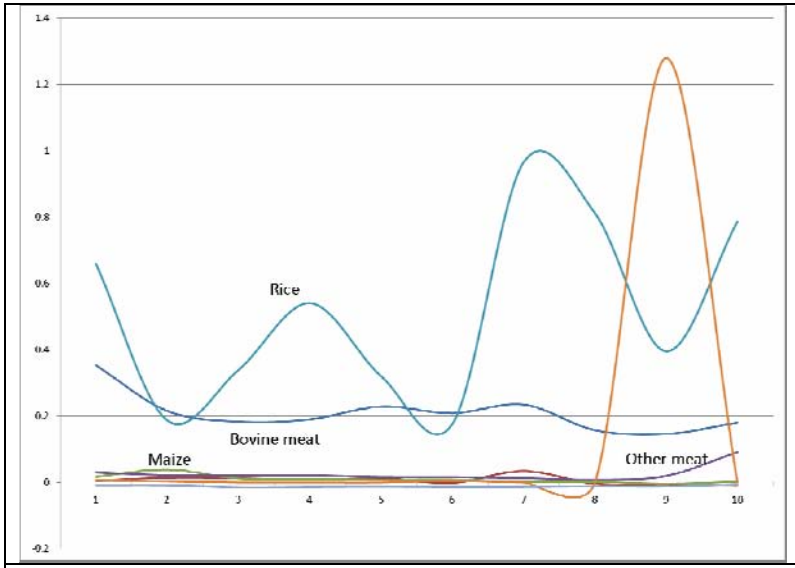


Pakistan Rural

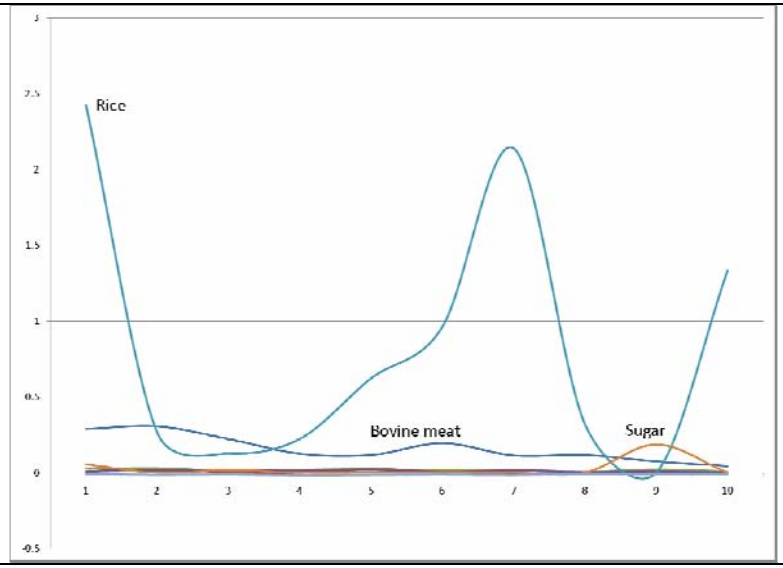


Pakistan Urban

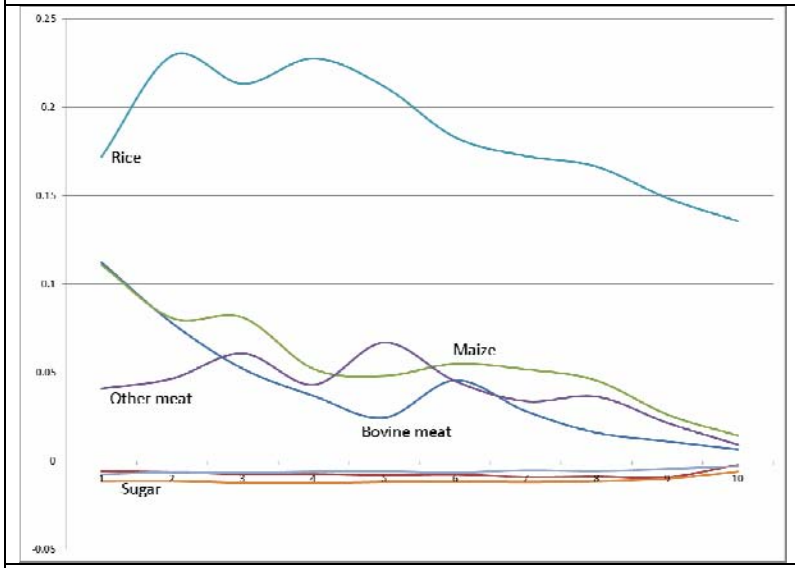
Figure 2: Sales of each commodity as a share of total expenditures, % (continued)



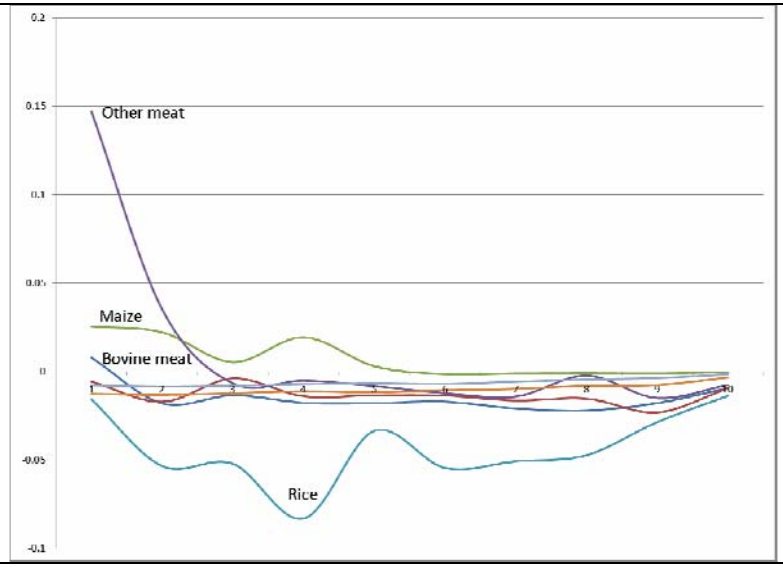
Peru Rural



Peru Urban

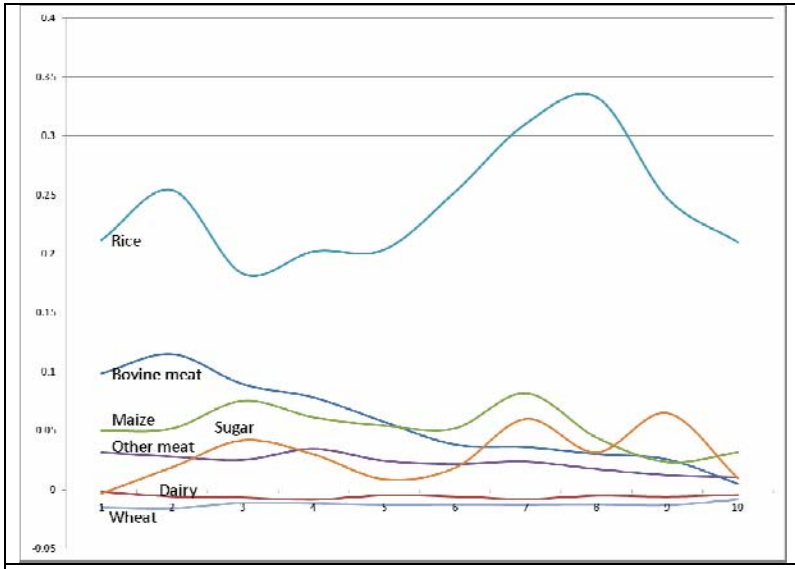


Vietnam 2004 Rural

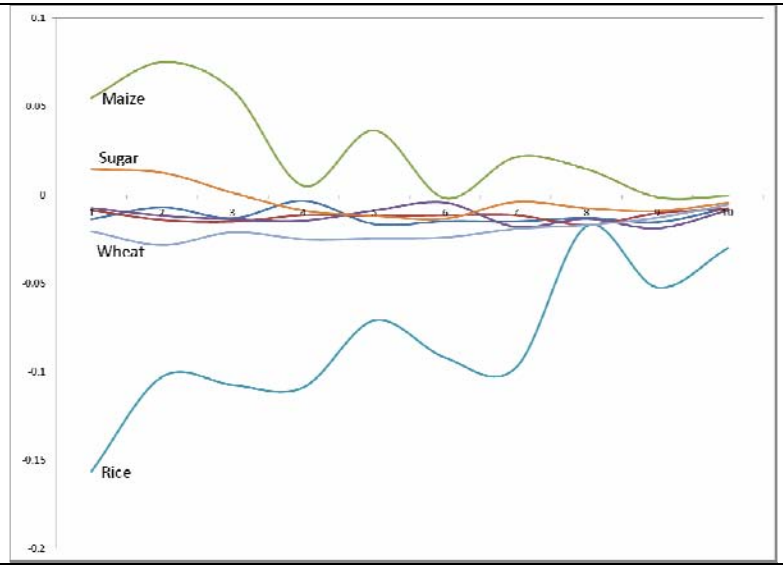


Vietnam 2004 Urban

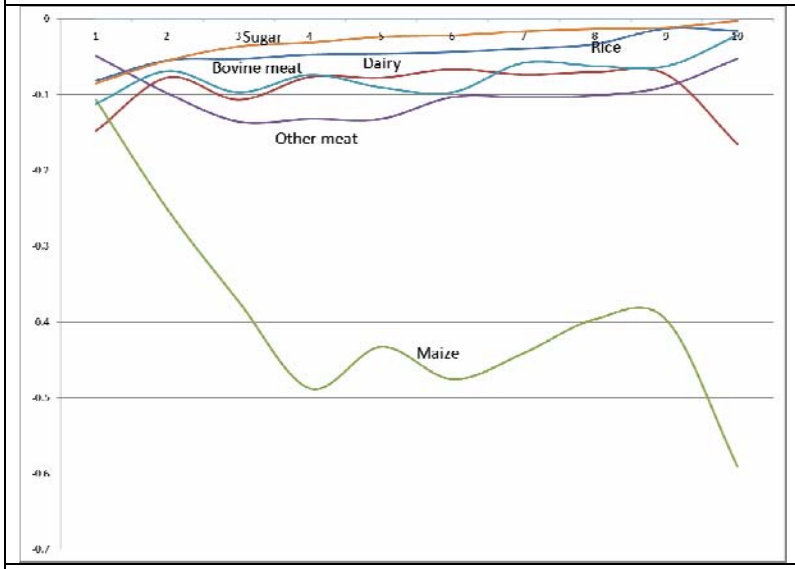
Figure 2: Sales of each commodity as a share of total expenditures, % (continued)



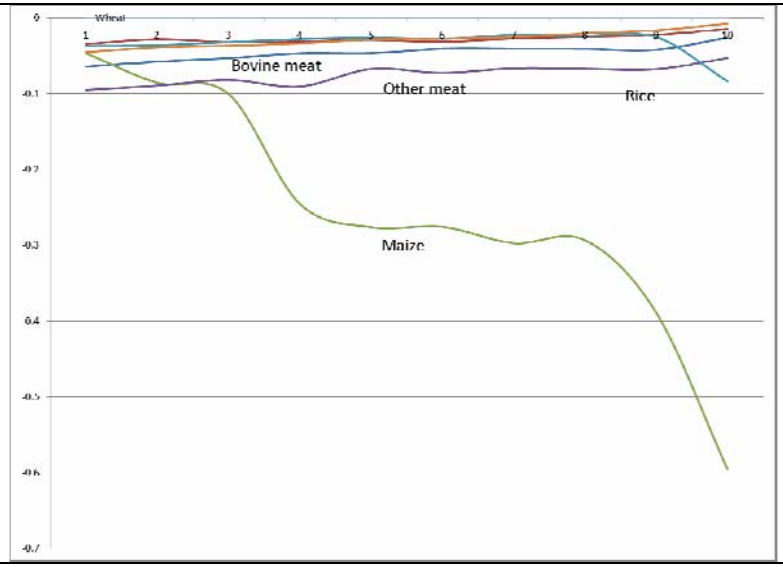
Vietnam 1998 Rural



Vietnam 1998 Urban

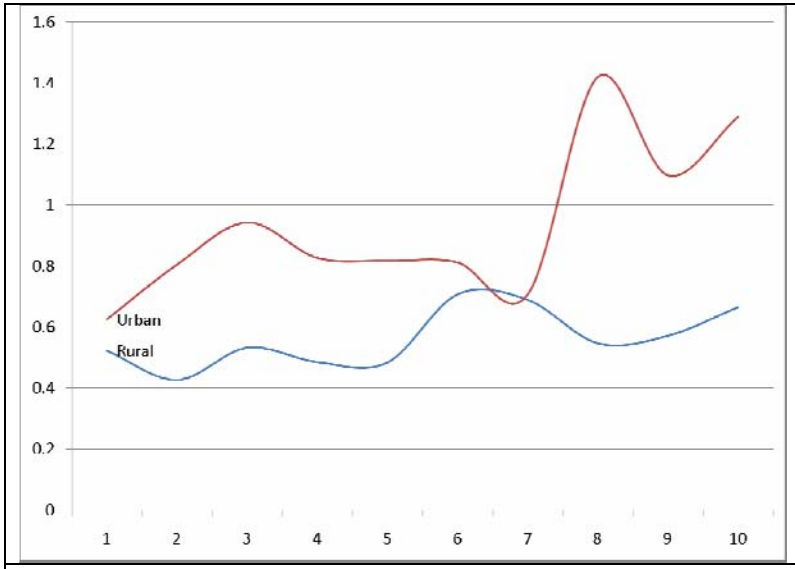


Zambia Rural

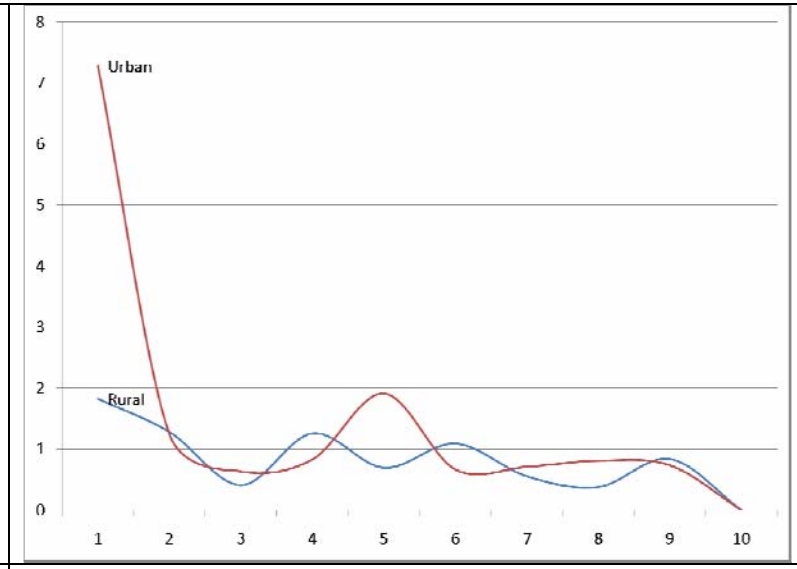


Zambia Urban

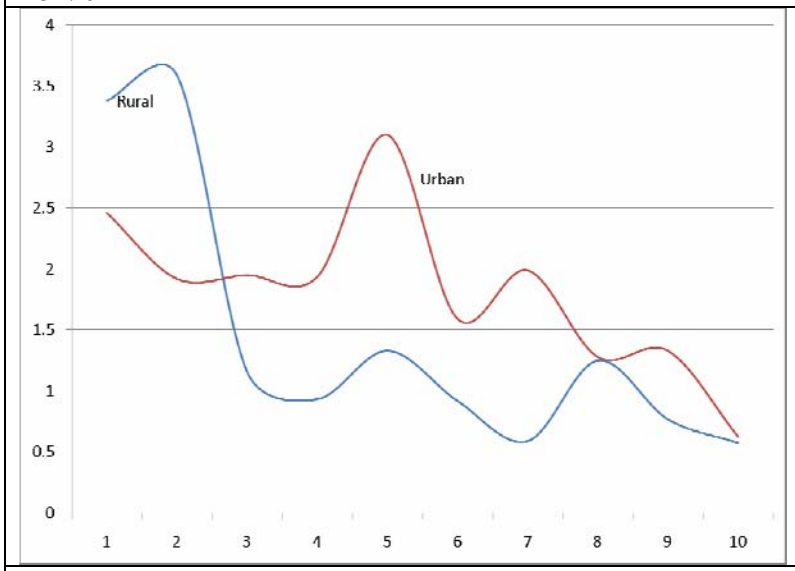
Figure 3: Shares of total expenditure from sales of unskilled labor by rural and urban households



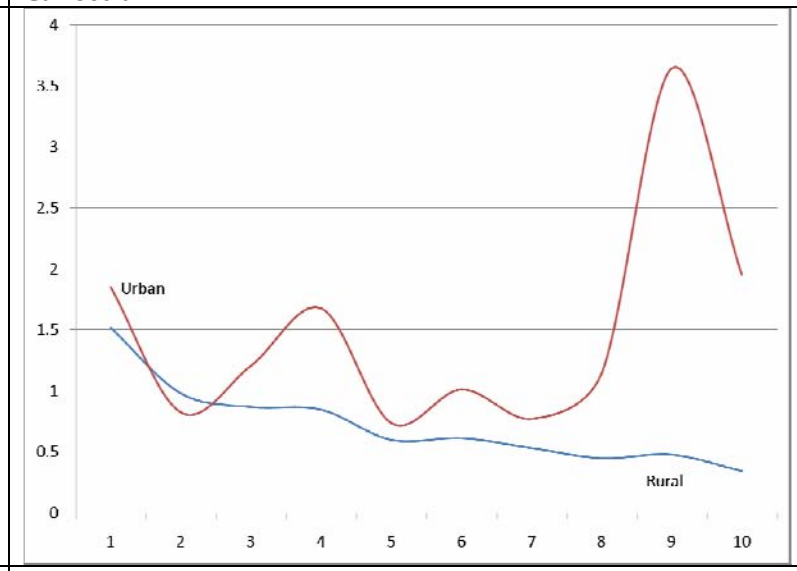
Bolivia



Cambodia

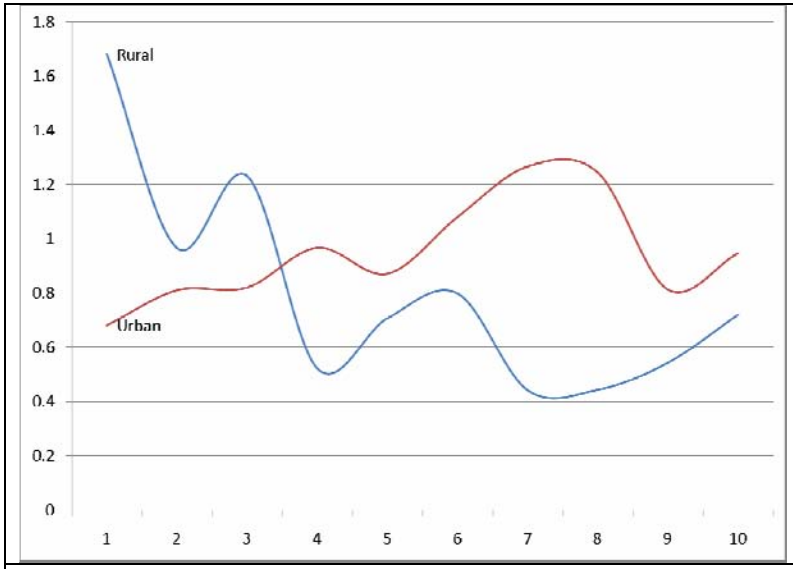


Malawi

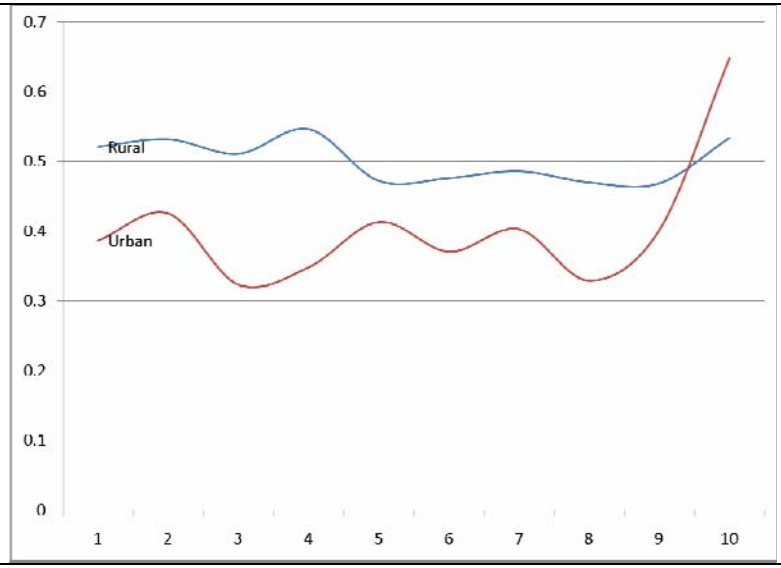


Madagascar

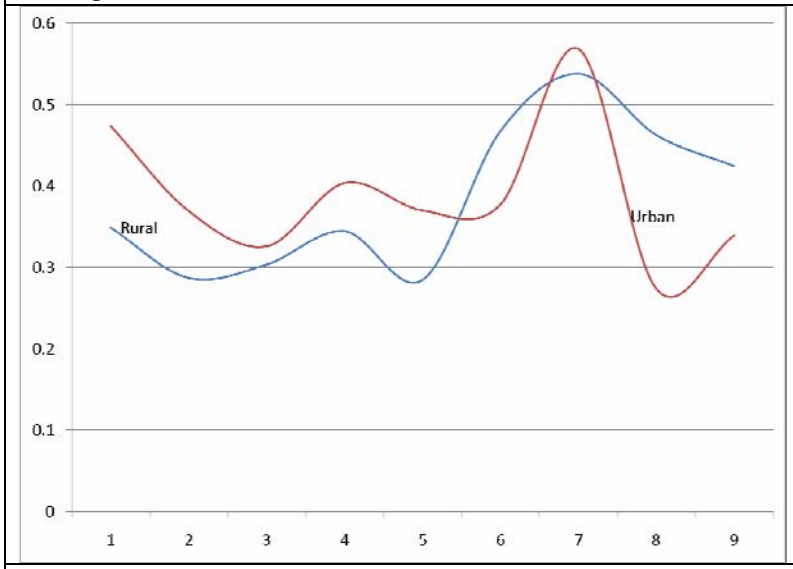
Figure 3: Shares of total expenditure from sales of unskilled labor by rural and urban households (continued)



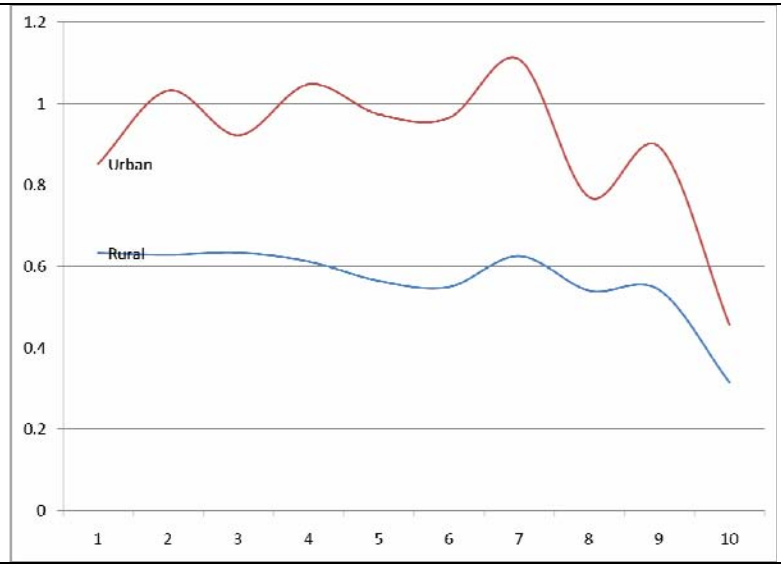
Nicaragua



Pakistan

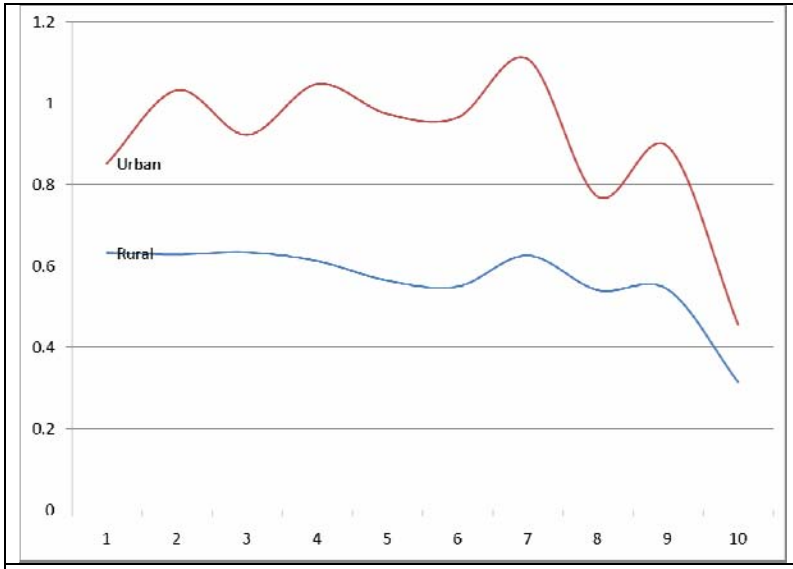


Peru

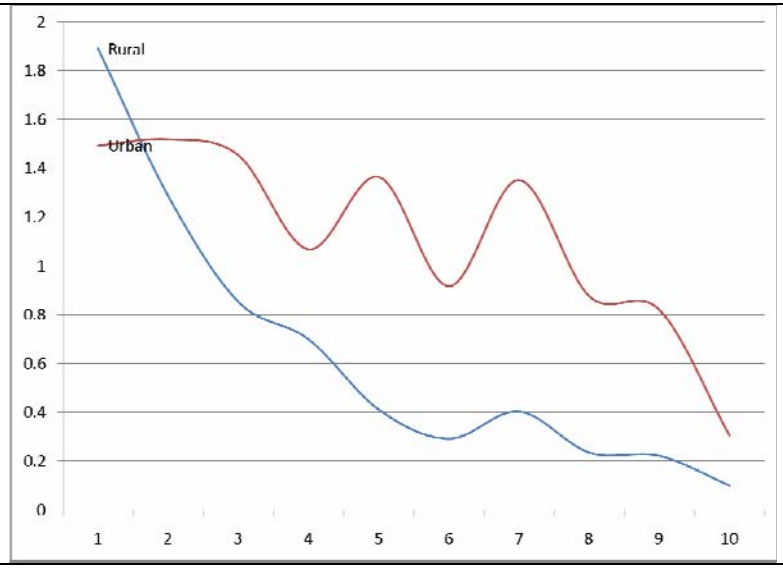


Vietnam 2004

Figure 3: Shares of total expenditure from sales of unskilled labor by rural and urban households (continued)



Vietnam 1998



Zambia

8 Appendix A

8.1 The Methodology used in the Analysis

We use a very simple methodology based on that used in Singh, Squire and Strauss (1986) and Deaton (1989; 1997, p185) for the analysis of household survey data. We represent the impact of price changes on an individual household, *i*, using an expenditure function to characterize household consumption and factor supply behavior and a profit function to represent household production activities through unincorporated enterprises such as family farms. The expenditure function, $e(p,w,u)$ is defined over a vector of prices of consumed goods, *p*, a vector *w* of the prices of supplied factors, and the utility level of the household. The profit function, $\pi(p,w,v)$ is defined over the prices, *p*, of goods produced or purchased as inputs, *w* of prices of variable factors purchased; and *v* of fixed factors such as land, management skills and any quasi-fixed inputs provided by the household to its own firm.

By the envelope theorem, the first derivatives of the expenditure function with respect to prices, e_p, indicate the quantities of goods demanded by the household, while its derivatives with respect to factor prices, e_w, indicate the negative of the quantities of factors supplied. Similarly, the derivatives of the profit function with respect to *p*, represent the net output supply functions, its derivatives with respect to *w*, π_w, indicate the negative of the quantities of variable factor inputs demanded; and its derivatives with respect to *v* represent rates of return to fixed factors.

The vector of outputs of the family firm is given by π_p and the impact of a change in prices, *dp*, of these goods on firm net revenue is given by $\pi_p dp$. Similarly, the impact of a change in prices of variable factor inputs on the net income of the firm is given by $\pi_w dw$. The impact of a change in prices on the cost of living of the household is given by $e_p dp$ and the impact of a change in factor prices on household returns is given by $e_w dw$. Under constant returns to scale, net profits are given by $\pi_p p + \pi_w w$ and are exactly exhausted by returns to

factors $\pi_v v$. The effects of a change in p on profits can be evaluated directly using $\pi_p dp$ or indirectly by evaluating the derivative of π_v with respect to commodity prices, $\pi_v p$, and evaluating $\pi_v p \times dp \times v$. Given our interest in specific commodity prices, we focus on $\pi_p p + \pi_w w$.

If utility is held constant, a compensation measure of the impact on the welfare of household *i* resulting from changes in the prices of consumer goods or factors is given by changes in B_i:

(A.1) $B_i = e(p,w,u_i) - \pi(p,w,v_i) - \tau_i$

where τ_i is the transfer to household *i* from the government. This formulation takes into account the fact that increases in the prices of consumption goods raise the cost of attaining a given level of utility, but also raise the profits available to the household from its production activities.[9] Assuming no changes in the transfers made by government, a first-order approximation to the welfare impact of changes in the prices of tradable goods, *dp*, is given by

(A.2) $dB_i = z_{pi}\, dp + zw_i\, (dw/dp)\, dp$

where $z_{pi} = e_{pi} - \pi_{pi}$ and $z_{wi} = e_{wi} - \pi_{wi}$ represent household *i*'s net purchases of consumer goods and net sales of factors respectively. The matrix (dw/dp) is the Stolper-Samuelson matrix relating factor prices to changes in the domestic prices of traded goods.

Equation (A.2) is converted into percentage change form and used to estimate the compensated change in achievable household expenditure resulting from the policy changes considered. This yields an equation like that used by Deaton (1989; 1997, p185) to evaluate the welfare impacts of price changes:

(A.3) $dB_i/e_i = S_i\, dp/p + Sw_i\, (dw_i/dp_i)\, dp$

[9] Because of the absence of distortions at the household level in our framework, the compensation approach used in this paper is identical with the money metric approach used in Chen and Ravallion (2004b).

where dB_i/e_i is the proportional change in the real attainable expenditure of household *i*; S_i is the vector of shares of net sales in the total net expenditure of the household; and Sw*i* is the shares of the relevant net factor incomes in total household expenditure. This analysis uses income and expenditure shares, and information on the distribution of incomes around the poverty line to assess the effect of changes in protection, and in product prices, on poverty.

Equation (A.3) provides a first-order approximation to the effect of the price changes on real incomes. We calculate the real income level after introduction of the policy by adding the equivalent variation, represented by dB_i, to the current level of observed expenditure *B*i for each household to find its achievable level of expenditure after the price changes take effect. By comparing the new achievable level of expenditure with the established poverty-line level of expenditure for each country, we are able to use individual survey records to identify and count the number of households in poverty and the gap between their income level and the poverty line after the change in policy. We then cumulate these shocks to see the impact on poverty, and compare these impacts with those prevailing when wages are also able to adjust. Finally, we use these data to calculate two widely-used measures of the poverty—the poverty headcount and the poverty gap (Ravallion and van der Walle 1991). The first measures the percentage of people falling below the poverty line and the second the extent to which the incomes of the poor fall below the poverty line as a fraction of the poverty line, including the poverty line for all people, but the poverty gap only for those below the poverty line.

9 Appendix B: Robustness Checks

The approach that we have used is very simple, and questions inevitably arise about the robustness of our conclusions, and whether they can be generalized. One key question concerns the magnitude of the response of poverty to larger or smaller changes in prices—are the results specific to the number of households grouped near the poverty line, or can they be, very broadly, scaled up or down to obtain an indication of the impact for a larger or smaller shock? Another concerns the impact on incomes throughout the distribution of income—are the impacts reported applicable only for a particular, and inherently somewhat arbitrary—poverty line, or do they apply at different levels of income? And finally, what are the impacts on poverty if the structure of the labor market differs from that assumed in the simulations presented in the body of the paper. In this appendix, we examine each of these issues in turn.

9.1 The size of the price change

As previously noted, the 10 percent price increase used in the preliminary simulations in this paper is quite arbitrary. Although the results of these simulations provide valuable information about the structure of production and consumption, and about the consequent welfare impacts of changing particular prices, it is difficult to know whether they provide any useful insights when considering changes in prices of a different magnitude. An important element of uncertainty arises from the possibility that large numbers of people might be on the threshold of poverty, brought to the threshold of poverty, or moved away from the threshold by an initial increase of 10 percent.

One way to get a feel for whether the impacts of a 10 percent change in prices on the poverty rate might be extrapolated for slightly larger shocks, is to compare the effects of 10 percent changes with the effects of somewhat larger changes. This is done in Table B.2, which presents the poverty rate and poverty gap results for commodity price changes of 10 and 20 percent, and the ratio of the effect of a 20 percent price increase to that for a 10

percent price increase. If the effects are proportional, then the ratio of the two measures will be 2.0.

Table B.2: The ratio of the effect on the poverty rate and the poverty gap of moving from 10 to a 20 percent increase in prices. All considered products, no wage impacts

		Poverty rate			Poverty gap		
		10%	20%	Ratio	10%	20%	Ratio
Bolivia	Rural	0.5	1.0	2.1	0.3	0.6	2.1
	Urban	0.6	1.0	1.7	0.2	0.4	2.1
	Total	0.5	1.0	1.9	0.2	0.5	2.1
Cambodia	Rural	0.3	0.6	2.5	0.6	1.3	2.3
	Urban	0.5	1.0	2.1	0.2	0.4	2.2
	Total	0.3	0.7	2.4	0.5	1.1	2.3
Madagascar	Rural	1.9	2.3	1.2	0.7	1.5	2.2
	Urban	1.8	3.6	2.0	1.0	2.1	2.1
	Total	1.8	3.1	1.7	0.9	1.9	2.1
Malawi	Rural	0.6	1.3	2.3	0.2	0.5	2.1
	Urban	0.4	1.0	2.5	0.1	0.2	2.3
	Total	0.5	1.3	2.4	0.2	0.5	2.1
Nicaragua	Rural	1.5	2.3	1.6	0.8	1.8	2.1
	Urban	2.7	4.3	1.6	0.9	1.9	2.1
	Total	2.1	3.4	1.6	0.9	1.8	2.1
Pakistan	Rural	-0.1	0.2	-3.1	0.1	0.3	3.9
	Urban	0.8	1.8	2.1	0.2	0.4	2.1
	Total	0.3	0.8	3.1	0.1	0.3	2.8
Peru	Rural	-0.1	-0.3	5.5	-0.1	-0.2	1.8
	Urban	-0.1	0.1	-1.0	-0.1	-0.1	1.9
	Total	-0.1	-0.2	3.3	-0.1	-0.2	1.9
Vietnam 2004	Rural	-1.4	-2.3	1.7	-0.4	-0.7	1.8
	Urban	0.2	0.2	1.2	0.0	0.0	4.1
	Total	-1.0	-1.7	1.7	-0.3	-0.5	1.7
Vietnam 1998	Rural	-0.9	-1.7	1.8	-0.4	-0.6	1.7
	Urban	0.3	0.8	2.8	0.1	0.3	2.2
	Total	-0.6	-1.0	1.7	-0.2	-0.3	1.6
Zambia	Rural	1.1	2.1	1.9	0.8	1.8	2.1
	Urban	0.6	1.0	1.8	0.5	1.0	2.0
	Total	0.8	1.6	1.9	0.7	1.4	2.1
Average	Rural	0.5	0.7	1.7	0.4	0.8	2.3
	Urban	0.9	1.6	1.5	0.4	0.8	2.3
	Total	0.6	1.1	2.2	0.4	0.8	2.1

Average excludes Vietnam 1998

The ratios presented in Table 2 are, in most cases, relatively close to two for significantly big changes, suggesting that it may not be unreasonable to roughly double the effects of a 10 percent increase in prices in order to obtain a rough estimate of the effects of a 20 percent change in prices. However, there are a few notable exceptions, particularly the impact on rural poverty in Pakistan, where a small reduction in poverty from a 10 percent increase in prices changes into a much larger increase for a 20 percent increase in prices. Another standout result occurs in rural Peru, where the reduction in rural poverty is 5.5 times as great for an increase of 20 percent in prices.

This sensitivity analysis should not be taken to imply that the results presented in this paper could be reliably extrapolated to larger changes in prices. The standard fixed-shares approach used in this paper is valid only for relatively small changes. While it provides a first-order approximation to the effects of larger price changes, these may become less reliable as second order changes in the revenue impacts become more important.

9.2 Robustness to changes in the poverty line

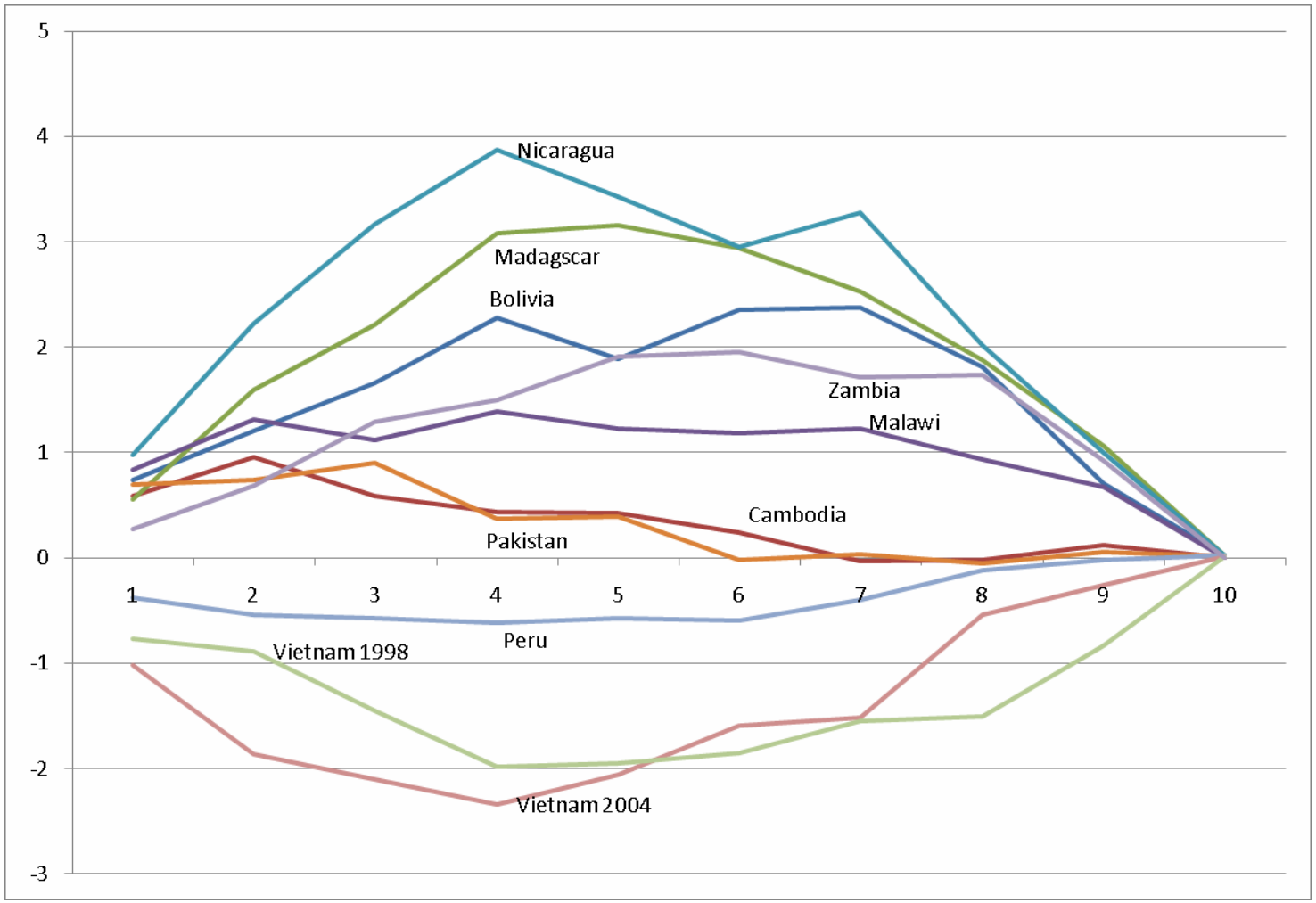
Given the somewhat arbitrary nature of any poverty line, it is of considerable interest to consider the robustness of our results to the choice of poverty line. One approach to this problem is to assess whether the shock considered moves the cumulative distribution of income to the right at all points—implying that welfare will increase for all members of society (Ravallion 1992). To address the sensitivity of our results to this issue, we examine whether poverty falls at different settings of the poverty line.

Figure B.1 shows the impact on poverty with the poverty line set at the income level that defines the upper income limit for each decile group. We report results for one of our reference shocks—a ten percent increase in the prices of all goods. More detailed calculations, covering impacts of individual products, were also performed and are available from the authors on request, but the volume of output in this situation is formidable.

Figure B.1 suggests that the results for poverty reported in Table 2 are generally quite robust to any reasonable choice of poverty line. For Madagascar and Nicaragua, it appears that the poverty lines we used—which designate 61 percent and 45 percent of their populations as poor— provide close to the largest poverty rate impact of any poverty line choice. By contrast, in Bolivia where 23 percent of the population is classified as poor, the poverty impact would be nearly twice as large if the poverty line were set at around 55 percent of the population.

Importantly, the results in the graph suggest that sign reversals resulting from different settings of the poverty line would be rare. For six country-periods, the effect of raising these prices by 10 percent would be to increase the poverty headcount relative to almost all poverty lines. For two, Peru and Vietnam, there would be reductions in the poverty line, albeit smaller reductions than most of the increases in the other countries. The only case evident for this experiment is in Pakistan, where setting the poverty line above 65 percent of the population—instead of above the income of 17 percent of the population—would change the result of this experiment from an increase in to a reduction of poverty.

Figure B.1 Impacts of a 10% increase in the price of all considered food commodities on poverty with the poverty rate set at each decile income level.



9.3 Labor Market Specification

The analysis presented in the body of the paper includes two labor market specifications. The first, the no-wage impact specification in Tables 2 and 5, assumes that the unskilled wage rates relevant to poor people do not change in response to commodity price changes. The second specification and the policy analyses, assumes that unskilled labor is mobile between agricultural and non-agricultural employment, with a wage rate that responds to changes in the prices of all final goods. This assumption is supported by Bertrand and Squire (1980) who find great mobility of labor between rural agricultural and urban industrial jobs in Thailand. One possible concern with this specification is the possibility of some resistance to mobility between agricultural and non-agricultural labor markets in other countries. To allow for this possibility, we consider in this appendix the possibility that agricultural and non-agricultural labor markets are segmented. Based on econometric estimates for China (see Ianchovichina and Martin 2004), we specified this segmentation using an elasticity transformation of 1.32 between urban and rural labor markets.

As noted in the discussion in the main body of the paper, allowing for increases in wage rates in response to changes in commodity prices, does reduce the generally adverse impact of increases in the prices of these commodities for poverty. Incorporating a barrier to mobility between agricultural and nonagricultural labor markets does tend to concentrate the impact of commodity prices on agricultural wages. Since many more rural households sell their labor in agriculture, an effect of this specification is to favor the rural poor relative to the urban poor. When we move to the segmented market case, the effect of the price change on the rural poor improves in five out of ten cases. On average, the impact of this change on the rural poor also improves, with it increasing the rural poverty rate by 0.1 percent instead of 0.3. However, the impact on the urban poor is adverse, with the poverty impact rising from 0.6 to 0.8. The overall impact on poverty remains essentially the same, at 0.4. A similar

pattern is evident when considering the effect of this price change on the poverty gap, with the overall poverty impact changing very little, the impact on rural people becoming less adverse and that on urban people becoming worse.

Table B.3: Wage impacts of 10% rise in prices of all considered food items

	Integrated labor market	Segmented labor market - agricultural labor	Segmented labor market - non-agricultural labor
Bolivia	0.5	4.2	-0.1
Cambodia	0.6	4.2	-0.1
Madagascar	4.2	9.4	0.2
Malawi	1.0	3.6	0.3
Nicaragua	0.3	5.0	-0.2
Pakistan	1.4	7.7	0.4
Peru	0.7	3.6	0.2
Vietnam	0.9	5.0	0.3
Zambia	0.9	2.9	0.3

Table B.4: Effects of labor market specifications—10% rise in prices of all considered food items

		Poverty rates			Poverty gaps		
		No wage	Integrated labor market	Segmented labor market	No wage	Integrated labor market	Segmented labor market
Bolivia	Rural	0.5	0.4	-0.2	0.3	0.2	-0.1
	Urban	0.6	0.6	0.6	0.2	0.2	0.2
	Total	0.5	0.5	0.2	0.2	0.2	0.1
Cambodia	Rural	0.3	0.1	0.0	0.6	0.5	0.5
	Urban	0.5	0.2	0.4	0.2	0.1	0.2
	Total	0.3	0.1	0.1	0.5	0.4	0.4
Madagascar	Rural	1.9	1.4	1.8	0.7	0.4	0.6
	Urban	1.8	0.2	1.5	1.0	0.1	0.8
	Total	1.8	0.7	1.6	0.9	0.2	0.7
Malawi	Rural	0.6	0.5	0.5	0.2	0.2	0.2
	Urban	0.4	0.3	0.3	0.1	0.1	0.1
	Total	0.5	0.5	0.5	0.2	0.2	0.2
Nicaragua	Rural	1.5	1.4	1.4	0.8	0.8	0.8
	Urban	2.7	2.5	2.6	0.9	0.8	0.9
	Total	2.1	2.0	2.1	0.9	0.8	0.9
Pakistan	Rural	-0.1	-0.3	-1.0	0.1	0.0	-0.1
	Urban	0.8	0.8	0.8	0.2	0.2	0.2
	Total	0.3	0.1	-0.3	0.1	0.1	0.0
Peru	Rural	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
	Urban	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
	Total	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Vietnam 2004	Rural	-1.4	-1.5	-1.8	-0.4	-0.4	-0.5
	Urban	0.2	0.0	0.1	0.0	0.0	0.0
	Total	-1.0	-1.1	-1.3	-0.3	-0.3	-0.4
Vietnam 1998	Rural	-0.9	-1.1	-1.4	-0.4	-0.4	-0.5
	Urban	0.3	0.2	0.1	0.1	0.1	0.1
	Total	-0.6	-0.7	-1.0	-0.2	-0.3	-0.3
Zambia	Rural	1.1	1.1	1.1	0.8	0.8	0.8
	Urban	0.6	0.5	0.5	0.5	0.3	0.4
	Total	0.8	0.8	0.8	0.7	0.6	0.6
Average	Rural	0.5	0.3	0.1	0.4	0.3	0.2
	Urban	0.9	0.6	0.8	0.4	0.2	0.3
	Total	0.6	0.4	0.4	0.4	0.2	0.3

Average excludes Vietnam 1998